PILOT TEST REPORT FOR *IN SITU* TREATMENT USING ENHANCED BIOREMEDIATION

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SECTION 1

PROJECT DESCRIPTION

This report describes the methods and results of a pilot test that were performed to assess the applicability and feasibility of enhanced *in situ* bioremediation for chlorinated compounds of concern (COCs) in bedrock groundwater at the former Ekonol Polyester Resins facility (the Site) in Wheatfield, New York. All work reported in this document was completed in accordance with the Pilot Test Work Plan for *In Situ* Treatment Using Enhanced Bioremediation (Parsons, 2007). The work plan was approved by the New York State Department of Environmental Conservation (NYSDEC) on August 29, 2007.

1.1 INTRODUCTION

The former Ekonol Polyester Resins facility is located at 6600 Walmore Road, approximately one-half mile north of Niagara Falls Boulevard (Route 62) in the Town of Wheatfield, New York (Figure 1.1). The Site is impacted by chlorinated compounds of concern (COCs) related to previous Site operations. Major activities associated with the Site remediation are:

- initial removal of the containment tank,
- various phases of Site characterization and groundwater monitoring,
- remedial alternatives assessment, and
- laboratory treatability testing and initiation of the pilot test.

The potential treatment program being evaluated consists of a substrate (emulsified vegetable oil, sodium bromide and Site groundwater) injected as a carbon source into the bedrock groundwater to promote biodegradation of chlorinated COCs.

1.2 PILOT TEST OBJECTIVES

The goal of the field-scale pilot test described in this report is to determine if enhanced *in situ* bioremediation is a viable treatment option for chlorinated COCs in bedrock groundwater at the Site. The objectives of the pilot test are presented in the results section of this report, along with an assessment of how the results of pilot test fulfilled the data requirements of each objective.

1.3 SCOPE OF WORK

The pilot test was comprised of (1) treatment area characterization and system installation (2) treatment application and (3) performance monitoring. Injection boreholes were used to apply the substrate to the fractured bedrock for the treatment application. Eight monitoring wells were included in the performance monitoring program. Figure 1.2

provides a Site plan and a layout of the pilot test area. Details of the pilot test program are provided in Section 2.

SECTION 2

Pilot Test Implementation

2.1 FIELD ACTIVITIES

Field activities associated with this project include mobilization, installation of system components (i.e., injection and monitoring wells), evaluation of local bedrock hydraulics, baseline characterization, injection of substrate, injection of a bioaugmentation culture, injection of a buffering agent, performance monitoring, and waste handling. The following is a timeline of pertinent events completed during the pilot test:

- **November – December, 2007:** Well Installations
- **January 14- 15, 2008:** Baseline Groundwater Sampling
- **June 17 – June 19, 2008:** Pilot Test Injection at INJ-01 and INJ-04
- **July 21 – 23, 2008:** Performance Monitoring No. 1
- **August 19 -20, 2008:** Bioaugmentation INJ-01 and INJ-04
- **September 29 - October 1, 2008:** Performance Monitoring No. 2
- **November 24 – 25, 2008:** Buffered INJ-01 and INJ-04
- **December 11, 2008, 2008:** Performance Monitoring No. 3

2.2 SYSTEM INSTALLATION TREATMENT AREA CHARACTERIZATION

2.2.1 SYSTEM INSTALLATION

System installation for the pilot test consisted of advancing five injection boreholes and installing eight groundwater monitoring wells. Locations of the performance monitoring wells and injection boreholes are shown on Figure 2.1.

Seven bedrock performance monitoring wells (PMW-2D through PMW-8D) were constructed of 2-inch diameter stainless steel screens and risers. One performance monitoring well (PMW-1D) was installed with a 4-inch diameter stainless steel screen and riser. The five injection boreholes (INJ-01 through INJ-05) were drilled and left as open bedrock wells. The location and elevation of all wells and boreholes installed for this pilot study were surveyed by a land surveyor who was registered in the State of New York. Table 2.1 provides a summary of the construction details for the performance monitoring wells and injection boreholes. Boring logs for all of the wells are provided in Appendix A.

Injection boreholes and monitoring wells were developed after installation and prior to sampling. Development water was collected and staged in a polyethylene tank or 55-gallon drums pending proper disposal. The development records for each well are provided in Appendix A.

2.2.2 TREATMENT AREA CHARACTERIZATION

Prior to injecting the substrate, the treatment area was characterized for local hydraulic properties, COC concentrations, and microbiological and geochemical indicator parameters.

Hydraulic Characteristics

Local groundwater hydraulics were characterized through fracture observations and down hole measurements, water level measurements and drawdown tests during drilling and well development. A downhole caliper was used to evaluate the number and size of fractures in the bedrock water bearing zone for each boring location. In addition, a downhole camera was used to visually identify the number and size of fractures in the injection boreholes. Photos of the fractures in the boreholes and a summary of the data collected using the downhole caliper are provided in Appendix A. Water level measurements were collected during monitoring events performed in January, May, June, and July 2008. Drawdown test measurements were collected during well development in January 2008.

Baseline Sampling

To document baseline concentrations and biogeochemical conditions, groundwater sampling was completed prior to the substrate injection. Chemical parameters analyzed and results from the baseline sampling event are presented in Section 3 of this report. Well purging data and field measurements are presented in Appendix A.

2.3 TREATMENT APPLICATION

Prior to application of the substrate, an underground injection control permit from the United States Environmental Protection Agency (USEPA) for this project was obtained. Approximately 1,136 gallons of substrate and water were injected into INJ-01 and INJ-04 (approximately 568 gallons into each borehole). Table 2.2 provides a summary of the substrate injection for this pilot study.

Substrate

A slow-release emulsified vegetable oil commercial remediation product (SRS^{TM}) was used as the source of carbon for this pilot test. The SRS contained 60% vegetable oil, as well as low concentrations of lactic acid and nutrients that enhance substrate distribution and microbial growth. Sodium bromide (less than 1,000 mg/L) was also added to the substrate mixture as a conservative tracer.

Makeup Water

Site groundwater was extracted from pilot tests wells for use as make-up water in the substrate. The makeup water was mixed with the SRS^{TM} and sodium bromide in 600 gallon tanks using a pump.

The injection of contaminated groundwater mixed with the slow release substrate for *in situ* remediation was approved by the USEPA Groundwater Compliance Section using Underground Injection Control Identification Number UICID 08NY06307453.

Injection and Monitoring

Prior to substrate injection, pressure transducers were deployed in multiple wells surrounding the injection point to measure and record changes in pressure and water level elevation during substrate injection. Injection system pressures were monitored to avoid excessive pressure which could constitute a health and safety risk or fracture the bedrock matrix. The substrate was injected at rates ranging from 1 to 6 gallons per minute (gpm), during which no measureable pressure was recorded in the injection wells.

Groundwater samples were collected using a bailer from various performance monitoring wells during the injections to document that a minimum 15-foot radius of influence had been achieved. Bailer samples were examined for visual presence of the vegetable oil emulsion, which has a milky color that is easily observed in the field. Additionally, pressure transducers and specific conductivity probes were installed in multiple wells surrounding the injection points to measure and record changes in pressure and conductivity during substrate injection. Because the substrate has a higher specific conductivity than site groundwater, the conductivity probes are able to detect when the substrate arrived at each well. Bromide, a conservative tracer that was added to the substrate/water mixture, was analyzed in the field using a bromide probe as a confirmation of substrate distribution.

An injection of unamended Site groundwater was used to help remove residual vegetable oil from the injection borehole. The volume of this groundwater "push" was approximately 35 gallons.

2.4 PERFORMANCE MONITORING

The effects of the substrate injection were monitored over time by collecting groundwater samples from the eight newly-installed performance monitoring wells (PMW-1D – PMW-8D), two existing monitoring wells (RMW-2D and RMW-4D), and two injection boreholes (INJ-01 and INJ-02). Performance monitoring events were completed at approximately 4 weeks, 13 weeks, and 26 weeks after injection of the substrate. Details and results of the sampling and analysis are discussed in Section 3.

During substrate injection (June 2008), field readings were collected from all five injection boreholes, PMW-1D through PMW-8D, RMW-2D, and RMW-4D for bromide, oxidation reduction potential (ORP), conductivity, and pH. While bailing water from INJ-05, dense non-aqueous phase liquid (DNAPL) was observed. Subsequent to observing

DNAPL, the wells and boreholes were checked twice per week and DNAPL, when present, was recovered by either bailing or pumping. INJ-05 was the only location where DNAPL was observed.

After the June 2008 substrate injection, approximately four liters of DNAPL were recovered. On subsequent attempts, less than 500 milliliters (mL) of DNAPL were recovered, with the volume of DNAPL recovered decreasing over time. A total of approximately 4.9 liters of DNAPL were removed between July and September 2008.

In August, the post-injection monitoring and DNAPL recovery was reduced to an every other week schedule. From August to December 2008, 0 to 20 mL of DNAPL was recoverable from INJ-05, per event.

2.5 BIOAUGMENTATION INJECTION PLAN

Prior to the bioaugmentation injection, data from the performance monitoring event that was conducted 4 weeks after substrate injection was evaluated to confirm that a suitable anaerobic environment had been established. An injection of a microbial consortium including both *Dehalococcoides* and *Deahlobacter* species was performed at INJ-01 and INJ-04. The bioaugmentation culture was not genetically engineered or modified. The purpose of the augmentation was to determine if the addition of the microbe populations, given above, would accelerate the COC degradation.

The bioaugmentation was conducted approximately eight weeks after the substrate injections. The augmentation consisted of initially extracting groundwater from INJ-01 and INJ-04 under a nitrogen "blanket". The groundwater was then mixed with SRS^{TM} (used to prevent oxygenation of the water) at approximately a 4:1 ratio (4 gallons water : 1 gallon SRS^{TM},). Subsequently two liters of *Dehalococcoides* (DHC) and *Deahlobacter* (DHB) at concentrations greater than $1x10^{10}$ microbes/L each was added to mixture. After confirming that DO concentrations were less than 0.5 mg/L, approximately 120 – 130 gallons of the bioaugmentation solution was pumped into INJ-01 and approximately 100 gallons was pumped into INJ-04. Following each injection, 23 gallons of un-amended groundwater was pumped into each well to help distribute the bioaugmentation solution farther out into the formation.

2.6 pH BUFFERING

The pH was monitored prior to injection and at least monthly during the pilot test to assist in determining if the buffering capacity of site bedrock was sufficient to maintain a pH above 6.0 (see Section 3.3.4). A drop in pH from a pre-injection range between 6.9 and 7.5 to values around 6.0 was observed in the treatment area over the first 4 months of pilot test monitoring. During week 23, a buffering solution was injected into INJ-01 and INJ-04 to evaluate whether pH levels could be increased in the injection area. The buffering solution at INJ-01 consisted of 148 gallons of groundwater extracted from INJ-01 mixed with 3 pounds of sodium bicarbonate (baking soda). The buffering solution at INJ-04 consisted of 140 gallons of groundwater extracted from INJ-04 mixed with 6

pounds of sodium bicarbonate. The buffered groundwater was then pumped back into the well. All extracted groundwater was pumped into a polyethylene tank that was sparged with nitrogen to keep DO concentrations below 0.5 mg/L.

2.7 WASTE DISPOSAL

Investigation-derived waste (IDW) generated during the pilot test included soil from installation of the injection and monitoring wells, purge water from development and sampling of groundwater monitoring wells, equipment decontamination rinsate, and personal protective equipment (PPE) used during sampling activities.

Soil cuttings generated during field activities were collected in DOT approved 55-gallon steel drums and staged onsite. A sample of the containerized soil was collected and submitted for volatile organic compound (VOC) analysis by USEPA Method SW8260B. In addition, the soil was subjected to the toxicity characteristic leaching procedure.

Purge water generated during monitoring well development and initial (baseline) groundwater sampling was collected in a bulk storage tank. This purge water was sampled for VOCs by USEPA Method SW8260B, and properly disposed. All other decontamination and purge water generated during subsequent sampling events was containerized in 55-gallon drums and staged onsite. The drummed water was sampled, analyzed for VOC analysis by USEPA Method SW8260B, and properly disposed.

Expendable sampling equipment that was generated during field activities (e.g., PPE, sample tubing) were bagged, stored in 55-gallon drums, and disposed as a solid waste. Miscellaneous trash generated during field activities (e.g., empty sand bags, bentonite containers) was disposed of as municipal trash.

SECTION 3

PILOT TEST RESULTS

3.1 HYDROGEOLOGY

The hydrogeology and geology are consistent with previous site reports, including the depth and character of the fracture system. Boring logs were prepared for wells drilled during the pilot test (Appendix A). The soils from ground surface to approximately 10 to 12 feet below ground surface (bgs) appear to be a gradation of glaciolacustrine clay (little silt) with varves less than 2 millimeters to a fine grained till (clay, some silt, some sand, some gravel) at approximately 10 to 12 feet bgs. The clayey till interval is approximately 12 to 15 feet bgs where the contact to top of rock exists.

Well borings were cored approximately 10 feet into bedrock. The rock was consistent with previous drilling operations: Lockport dolomite. The dolomite is hard, massive, fine grained (saccrocoidal) with a scattering of fragmented coral fossils (favosites) and vugs. Vugs contained varying amounts of crystals including dolomite, calcite, gypsum, and galena. Mineralizations also occurred as irregular seams and closed vugs. Drill core observations indicate a continuous stromatalite deposit approximately 22 to 24 feet bgs. Figure 3.1 is a photograph of PMW-2D demonstrating a typical core. Several fractures were noted throughout the pilot test area. Near the top of rock (12 to 14 feet bgs), 1 to 2 closed, tight factures were observed. At approximately 22 to 24 feet bgs, 1 to 2 smooth, undulating, open, water bearing fractures were observed. Observations from multiple drilling cores indicated that fractures and other characteristics of the dolomitic bedrock are similar across the pilot test area.

Groundwater flow appears to be controlled by 1 to 2 near-horizontal fractures, spaced approximately 1 foot apart (vertically). The fractures are located approximately 22 to 24 feet bgs, where the stromatolite deposit is located. The effects of the fractures were noted during drilling as a slight change in core barrel advancement and the loss of drilling water. Boreholes were completed one to two feet below the depth where the drill water was lost. Additional characterization was completed using rock cores, borehole caliper measurements, and downhole camera videos. Appendix A contains a summary of the caliper measurements, core photos, and photos from the downhole camera. Observations indicated that the upper fracture is not continuous across the area, but the lower fracture is continuous. Based on caliper logs and drill water loss, the upper fracture is considered less permeable than the lower fracture. The upper fracture was typically tight to part open, and the lower fracture was typically open with an aperture ranging from 0.1 to 0.2 feet.

Downhole camera and drill core observations indicate that the fractures have a block and cavity character. Figure 3.2 is a conceptual drawing in which there is an open cavity bounded above and below by blocks of bedrock. These blocks are rock fragments, partially connected to the massive rock. The blocks are separated from the intact bedrock

by smaller fractures. This block and cavity character may cause higher tortuosity and larger volumes of dead-ended pore space than a smooth, flat facture.

During well development, drawdown observations were recorded. Drawdown in the open borehole injection wells was less than 0.5 feet while pumping at a rate of 2.5 gpm. Drawdown in the performance monitoring wells (finished with sand pack and well screen) was 2 to 3 feet at a pumping rate of approximately 2.5 gpm for all locations other than PMW-1D. The higher drawdown observed in performance monitoring wells is attributed to development of the sand pack. Drawdown at PMW-1D was considerably higher than other performance monitoring wells. PMW-1D was pumped dry at approximately 2 gpm. See Appendix A for well development records.

Depth to groundwater measurements were collected several times during the pilot test period. The depth to water ranges from approximately 6 to 8 feet bgs, which corresponds to elevations ranging from 577 to 579 feet above mean sea level (Table 3.1). Groundwater elevations varied by approximately 1 to 2 feet between measurement periods. Table 2.2 is a summary of groundwater elevation measurements collected during the pilot test.

The potentiometric surface in May 2008 (pre-injection) is shown in Figures 3.3. Groundwater flow is generally towards the south. The hydraulic gradient measured across the Site in May 2008 was approximately 0.003 feet/foot. Appendix A contains the water level measurements from this event. The direction and gradient are consistent with previous data.

3.2 SUBSTRATE DISTRIBUTION

Distribution of substrate was evaluated through visual observation of emulsified substrate, increases in specific conductivity and/or bromide using field instruments, and/or analysis of bromide and total organic carbon (TOC) concentrations in groundwater samples that are submitted to a fixed-based laboratory for analysis.

Bromide and Conductivity: Substrate was visually observed in all pilot test wells, including upgradient wells PMW-1D and RMW-2D. Conductivity measurements and the increase in bromide confirmed substrate break-through at each of the wells in the pilot test area (Appendix B). Figure 3.4 presents the concentration of bromide tracer recorded the day after the injections. Dilute bromide concentrations were observed in the up-gradient and downgradient wells. Based on the concentrations of bromide and conductivity measured during injection, the pilot test area is interpreted to have attained substrate concentrations in the range of 80-100% of the concentration of the injection mixture.

TOC: TOC measurements collected during performance monitoring in July 2008 (1 month after injection) provided further evidence that substrate was distributed throughout the injection area (see discussion below regarding TOC concentrations).

Radius of Influence: The radius of influence was achieved using approximately one quarter of the substrate volume estimated in the work plan. The reduction in the actual

injection volume is attributed to significantly lower bedrock porosity than originally estimated. Based on break-through volumes and the injection interval, the effective porosity in the pilot test area is estimated as approximately 1 percent (or less), which is lower than the 5 percent effective porosity assumed in the work plan phase.

The relatively rapid arrival times of dilute substrate concentrations observed in upgradient withdrawal wells during substrate injection suggests a high degree of fracture continuity across the pilot test area. This continuity results in favorable conditions for distributing the substrate in targeted areas.

3.3 GEOCHEMICAL AND BIOLOGICAL CHANGES

A consistent pattern of geochemical changes was induced as the result of substrate injection. Tables 3.2 through 3.4 and Figure 3.4 – 3.9 present analytical data collected during this pilot test. The most pronounced effects of the substrate were evident in wells PMW-3D, RMW-4D, PMW-4D and PMW-6D immediately downgradient of the injection points (INJ-01 and INJ-04). These wells define the inner treatment zone (Figure 3.4). Other wells in the pilot test area are considered outer treatment zone wells and are located upgradient, side-gradient, or downgradient to this inner treatment zone.

3.3.1 Sulfate and Sulfide

Sulfate: Sulfate reduction is related to the effectiveness of chlorinated VOC treatment as sulfate can be an inorganic electron acceptor that competes with chlorinated VOCs for available electron donors (i.e., carbon substrate). The natural levels of sulfate at the Site are greater than 1200 mg/L, as measured during the baseline monitoring event. Concentrations of sulfate within the inner treatment zone were reduced after the injection with concentrations ranging from 4 to 750 mg/L by December 2008.

Sulfide: Sulfide is a byproduct of sulfate reduction, and may limit dechlorination. During the baseline event, the concentrations of hydrogen sulfide were less than 0.9 mg/L, with the exception of 4.0 mg/L measured at well RMW-4D. Increases in hydrogen sulfide above the method detection limit of 5.0 mg/L were measured in October 2008, but returned to levels that were approximately the same as the baseline event by December 2008. Sulfide accumulation was temporary and did not inhibit the overall dechlorination process.

3.3.2 ORP

ORP conditions prior to substrate injection were moderately to strongly anaerobic, ranging from -126 to -352 millivolts (mV; Table 3.3). ORP conditions were reduced to less than -350 to -400 mV following substrate injection and strongly anaerobic conditions were established across the pilot test area. Figure 3.5 shows the reduction of ORP to values greater than -300 mV for the inner treatment zone wells. By the end of the 6-month pilot test, there was indication of slight increases in ORP. This increase in ORP, which corresponds to reduced TOC concentrations, is expected because a reduced TOC loading means that there is less electron donor available for driving redox conditions lower.

Nevertheless, the redox condition at this Site in December 2008 was sufficiently reduced to support efficient removal of chlorinated VOCs under an ORP range that is typical of sulfate reduction and methanogenesis (the highly anaerobic state that is most conducive to rapid biodegradation affecting the widest range of chlorinated COCs. (Bouwer, 1994).

3.3.3 Chloride as an Indicator of Reductive Dechlorination

Chloride ions are removed from chlorinated COCs during reductive dechlorination. Chloride concentrations in groundwater are expected to increase above baseline levels in areas where reductive dechlorination is being stimulated. Concentrations of chloride increased across the entire in the pilot test area. For example, chloride increased by more than a factor of three in RMW-4D and PMW-6D (see Figure 3.5).

3.3.4 Carbon Dioxide, Alkalinity, and pH

Dissolved Carbon Dioxide: Carbon dioxide is produced during the biodegradation of anthropogenic or native organic carbon. Baseline carbon dioxide concentrations ranged from 100 to 300 mg/L, and generally increased after substrate injection. The maximum concentration of carbon dioxide was measured just downgradient of the treatment area at concentrations that ranged between 3,000 and 4,000 mg/L. This suggests that biological activity increased substantially within and downgradient of the injection area as a result of substrate addition.

Alkalinity: Alkalinity is a measure of the ability of groundwater to buffer changes in pH. Microorganisms capable of the reductive dechlorination of COCs are known to grow optimally in environments with pH of greater than 6.0 (Volkering and Pijls, 2004). The buffering capacity of Site groundwater is an important factor controlling for pH and whether reductive dechlorination will occur. Additionally, alkalinity is another measure of microbial activity. Baseline concentrations of total alkalinity ranged from 260 mg/L to 360 mg/L. Following injection, alkalinity increased during the test to as high as 600 to 700 mg/L. However, in several locations, the alkalinity decreased to baseline levels, or lower, by the 6-month sampling event.

pH: A notable drop in pH was observed throughout the pilot test area, and several wells decreased below 6.0 (Table 3.4 and Figure 3.5).. The decrease stabilized in the range of 5.8 – 6.2 and began increasing approximately four months after the injection. The results indicate that bedrock buffering capacity was marginally sufficient to maintain pH at acceptable levels following the substrate injection.

As discussed in Section 2.7, groundwater in the vicinity of INJ-01 and INJ-04 was buffered approximately 5 months after the substrate injection with a goal of increasing pH around the injection wells (INJ-01 and INJ-04). It is unclear whether the buffering solution increased pH. The data do demonstrate, however, that the pH appears to have stabilized approximately 3 months following substrate injection (Figure 3.5), which was prior to the addition of the sodium bicarbonate buffering solution.

3.3.5 TOC, Metabolic Acids, and Biomass

Stimulation of biological activity may also be measured by analysis of TOC, volatile fatty acids (VFAs) and biomass. TOC concentrations in groundwater quantify the non-specific amount of organic carbon present. VFAs provide a more specific measurement of the types of organic compounds available for supporting microbial growth. Biomass concentrations provide direct measurements of the size of various microbial populations in the area of interest.

VFAs were measured for groundwater samples collected during each sample event (Table 3.2). Microbial biomass was also measured in the pilot test area (Table 3.5). Elevated concentrations of VFAs and biomass are indicative of biodegradation stimulated by the injection of the substrate. Furthermore, VFAs are further fermented to produce molecular hydrogen, which is the primary electron donor utilized for reductive dechlorination of chlorinated VOCs.

VFA concentrations measured prior to substrate injection were all below the analytical reporting limits (0.5 – 2 mg/l), indicating that there was little bioavailable organic carbon present in the aqueous phase prior to substrate injection. Total VFA concentrations increased substantially to approximately 200 mg/L to 900 mg/L, during the four-month period after the injection. These concentrations are indicative of significant biological degradation of the substrate. As of December 2008, concentrations of VFAs remained elevated within the inner treatment zone, ranging from 128 mg/L to 778 mg/L.

The microbial data shows (Table 3.5 and Figure 3.6) that total microbial mass has grown due to the substrate injection, but the direct impact of the bioaugmentation injection of chlorinated ethene concentrations is uncertain. DHC species are dominant in the injection wells, and DHB is dominant elsewhere. DHB domination of microbial population appears to correspond to the wells with the best overall degradation of chlorinated ethenes, but it is unclear how much, if any, of the increase in the DHB population resulted from the bioaugmentation injection.

3.4 CHLORINATED HYDROCARBON CHANGES

Groundwater analytical data collected during performance monitoring are presented in Table 3.6 Changes in TCE, cis-1,2-DCE, and VC concentrations over time in the inner treatment zone are plotted in Figure 3.7.

TCE: Within the injection zone (PMW-3D, RMW-4, PMW-4D, and PMW-6D), baseline concentrations of TCE ranged from 100,000 µg/L to 240,000 µg/L. Concentrations of TCE at these locations decreased to levels ranging from 310 to 1,000 µg/L by the end of the 6-month sampling event. Most of the TCE decrease occurred in the period between the injection and the first performance monitoring event. These observations indicate the substrate injection resulted in sharp immediate decreases in TCE.

cis 1,2-DCE: As the concentration of TCE decreased during the first month of the test, the concentration of cis-1,2-DCE increased. Within the treatment area, concentrations of cis-1,2-DCE ranged from approximately 27,000 µg/L to 46,000 µg/L during the baseline event, and increased to the range of 85,000 to 160,000 µg/L during the first performance monitoring event. The concentrations of cis 1,2-DCE decreased during the remainder of the test. By the third performance monitoring event, the concentrations ranged from 5,600 to 23,000 µg/L. Overall, cis-1,2-DCE concentrations decreased from during the pilot test by approximately 10,000 to 35,000 µg/L.

VC: During the baseline event, concentrations of VC ranged from 420 to 2,100 µg/L, indicating that the degradation of DCE isomers by reductive dechlorination through VC occurs naturally at the Site. Trends in VC concentrations during the pilot test varied over time by location. In some locations, VC increased slightly, whereas at other locations VC decreased slightly. At several locations (PMW-2D, PMW-4D, PMW-5D, RMW-4D), a minor spike in VC was apparent during the first and second performance monitoring events, with maximum concentrations ranging between 1,100 and 2,600 µg/L. At downgradient locations MW-7D and PMW-7D, VC concentrations increased slightly until the end of the 6-month monitoring period, with maximum concentrations of 1,400 to 2,600 µg/L.

Figure 3.9 shows the percent change in the molar concentration of total chlorinated ethenes (i.e., the sum of TCE, cis-1,2-DCE and VC concentrations) for ten monitoring wells and one injection borehole between the baseline (January 2008) and final (December 2008) monitoring events. Decreases that ranged between 81 percent and 97 percent were observed in the inner treatment zone wells PMW-3D, RMW-4, PMW-4D, and PMW-6D (Figure 3.8, and Table 3.7). Reduction in total chlorinated ethenes was also observed at both downgradient wells (39 percent at PWM-7D and 56 percent at MW-7D). The change in total chlorinated ethene concentrations at wells outside of the inner treatment zone varied between a 67 percent increase at INJ-01 and a 52 percent decrease at PMW-8D. The wide range of total chlorinated ethene removal percentages may be attributed to variation in the amount of substrate reaching these wells and the occurrence of chlorinated VOCs migrating into the pilot test area from impacted upgradient groundwater.

3.5 EVALUATION OF PILOT TEST OBJECTIVES

The objectives indentified in the pilot test work plan (Parsons, 2007) were established to evaluate the effectiveness of enhanced bioremediation for treating chlorinated VOCs in bedrock. Each objective is listed below with a statement regarding the pilot test results in relation to the objective:

- **Create optimal geochemical conditions for anaerobic dechlorination.** Decreases of ORP, elevated concentrations of organic carbon (TOC and VFAs), decreases in sulfate, and stabilized pH across the inner treatment zone indicate that optimal conditions for anaerobic bio-dechlorination can be achieved (Figure 3.5 and Table 3.1).

- **Enhance the rates of *in situ* biodegradation of COCs.** Within the treatment area, the concentration of COCs decreased by 81 to 97 percent in six months.
- **Determine if enhanced *in situ* bioremediation is suitable to achieve the Site remediation goals for groundwater**. Significant decreases of COCs indicate that *in situ* bioremediation can accelerate the time required to achieve site remediation goals for groundwater.
- **Refine injection methodology and estimate a radius of influence**. Results of the testing indicate that an injection rate of up to 6 gpm results in no back pressure in the injection well. The low effective porosity of the rock (1 percent or less) and the presence of a significant horizontal bedrock fracture suggest that a radius of influence as large as 50 feet could be achieved by injection alone.
- **Assess the impacts of the injection of substrates and microorganisms on hydrogeology, especially groundwater movement**. Based on the observations made during the bedrock characterization and the pilot test monitoring, changes in the hydrogeology due to the substrate and microorganisms are not expected. The fracture apertures are significant enough to reduce the potential for a lowered hydraulic conductivity. Observations during the bioaugmentation and the buffering event did not indicate changes in hydraulic conductivity.
- **Assess the potential for solubility of inorganics (e.g., arsenic), generation of gases (e.g., methane, hydrogen or hydrogen sulfide), and other undesirable effects.** Results indicate that the substrate injection did not have a significant impact on solubility of inorganic compounds or produce other potentially undesirable affects.
- **Determine optimal design parameters for potential full-scale application of enhanced anaerobic bioremediation at the Site.** Information gained during the pilot test, including substrate loadings, buffering capacity, fracture geometry, and effective porosity, have been evaluated and can be used in future design and evaluation of a larger-scale application of enhanced bioremediation.

SECTION 4

CONCLUSIONS AND PATH FORWARD

This report presents the results of a pilot test for enhanced *in-situ* bioremediation of chlorinated solvents via organic substrate addition at the Ekonol Polyester Resins Site in Wheatfield, New York. The historical distribution of TCE and the intermediate dechlorination product *cis*-1,2-DCE in groundwater suggests that limited reductive dechlorination of chlorinated ethenes has occurred at the Site under natural conditions, and that the process was limited by an electron donor (organic substrate).

Overall, enhanced *in situ* bioremediation of chlorinated COCs in groundwater appears to be a viable treatment option for COCs in bedrock groundwater at the Site. Additional data are needed.

The data collected support the following conclusions:

- Transformation of TCE was rapidly achieved without sustained accumulation of DCE or VC.
- The changes in chlorinated VOC concentrations indicate that the observed decrease in TCE was enhanced by the addition of the substrate and biodegradation processes.
- An initial increase followed by a decline in DCE concentrations indicates that degradation of DCE has occurred.
- The observed VC concentrations indicate that the degradation pathway of DCE isomers to VC is limited. These data indicate that biodegradation can be enhanced, with a low probability of long-term VC accumulation.
- Decreases of total chlorinated ethenes within the inner treatment zone ranged from 81 to 97%, in a 6-month period.
- The depth to groundwater, high transmissivity, and fracture network are suitable for distribution of substrate throughout the source area, in direct contact with the impacted groundwater.
- The hydraulic gradient is relatively low, which provides sufficient residence time of Site groundwater within the inner treatment zone, for enhancing COC degradation.
- The native microbial population may be suitable for supporting optimal conditions for dechlorination after the addition of an electron donor (i.e., organic substrate). Available data do not indicate that application of a bioaugmentation culture will enhance the rate of COC removal; however, bioaugmentation may be beneficial in future injection applications.

Path Forward: Additional data are necessary to further evaluate the groundwater response to the initial injection and prepare for the design phase. Potential additional groundwater parameters are acetylene, selected cations/anions, and microbial analyses.

These data will be collected during a site-wide groundwater monitoring event anticipated for completion at the end of May 2009. Following collection and analysis of the additional data, an update to this report with plans for further action will be provided to NYSDEC.

SECTION 5

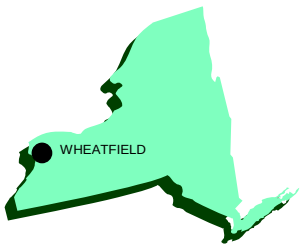
REFERENCES

Becker, Matthew W. 2004. Using Tracers to Understand Advection, Dispersion, and Diffusion in Fractured Rock: *U.S. EPA/NGWAFractured Rock Conference:State of the Science and Measuring Success in Remediation* September 13-15, 2004Portland, Maine, pp. 685 – 693.

Bouwer, E.J. 1994. Bioremediation of Chlorinated Solvents Using Alternate Electron Acceptors. In*: Handbook of Bioremediation*. CRC Press, Boca Raton, Florida.

Parsons. 2007. Letter to the NYSDEC: Treatability Testing Summary and Pilot Test Scope of Work.

FIGURES



New York

LATITUDE: N43° 06' 21"
LONGITUED: W78° 55' 46"

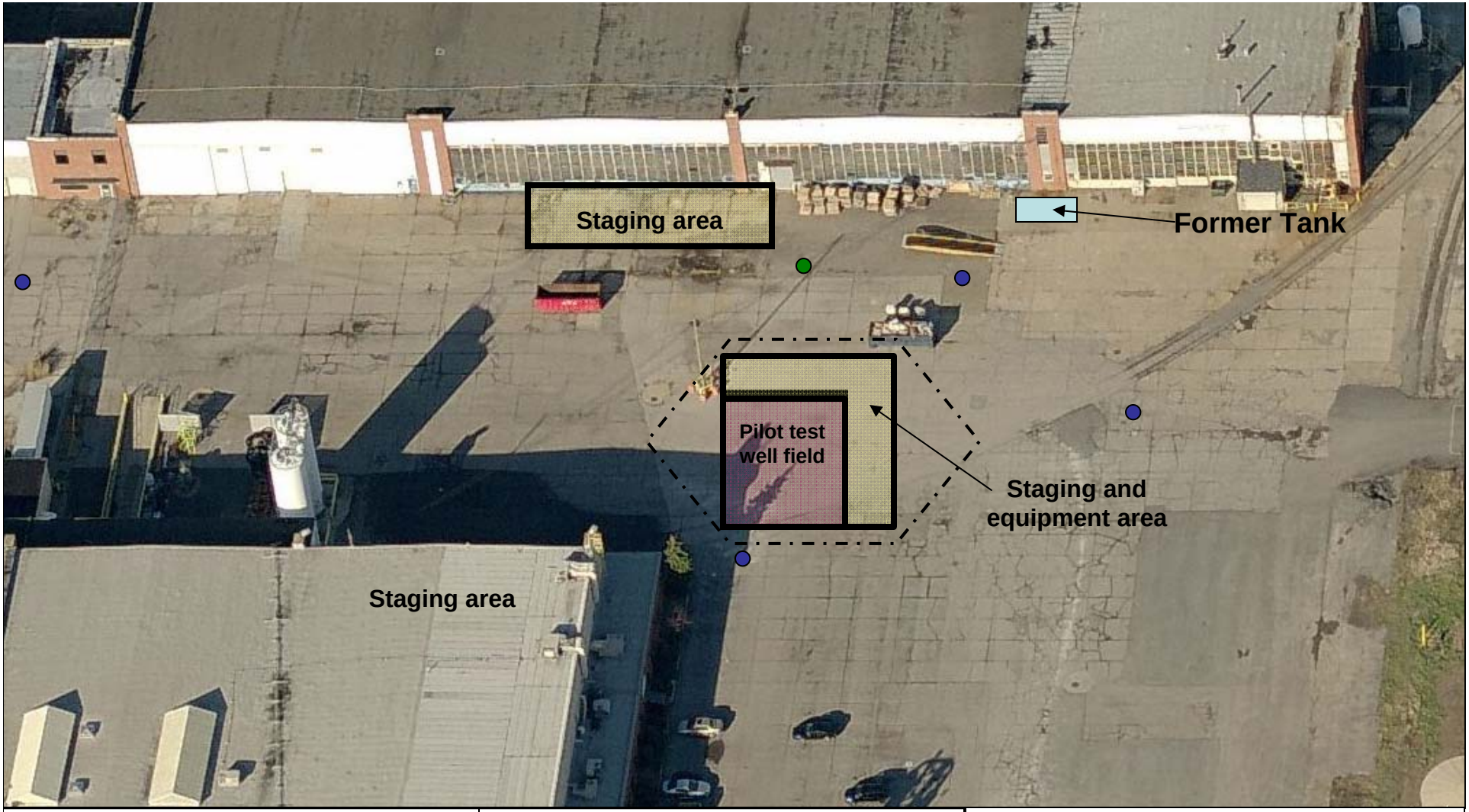
FIGURE 1.1

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NEW YORK

SITE LOCATION MAP

PARSONS
40 La Riviere Drive, Suite 350, Buffalo, New York 14202

P:\443970\WP\pilot test rpt\figure1.1_site_loc.ppt



LEGEND

- Pre-pilot Test existing well
- Pilot Test upgradient well PMW-1D
- Temporary Fence

APPROXIMATE SCALE

0 30 60 90 120

FEET

LOCATIONS ARE APPROXIMATE

P:\443970\WP\pilot test rpt\Tabs_figs\fig1.2_layout.ppt
Aerial photo source Pictometry International Corp.

FIGURE 1.2

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NEW YORK

SITE PLAN AND PILOT TEST LAYOUT

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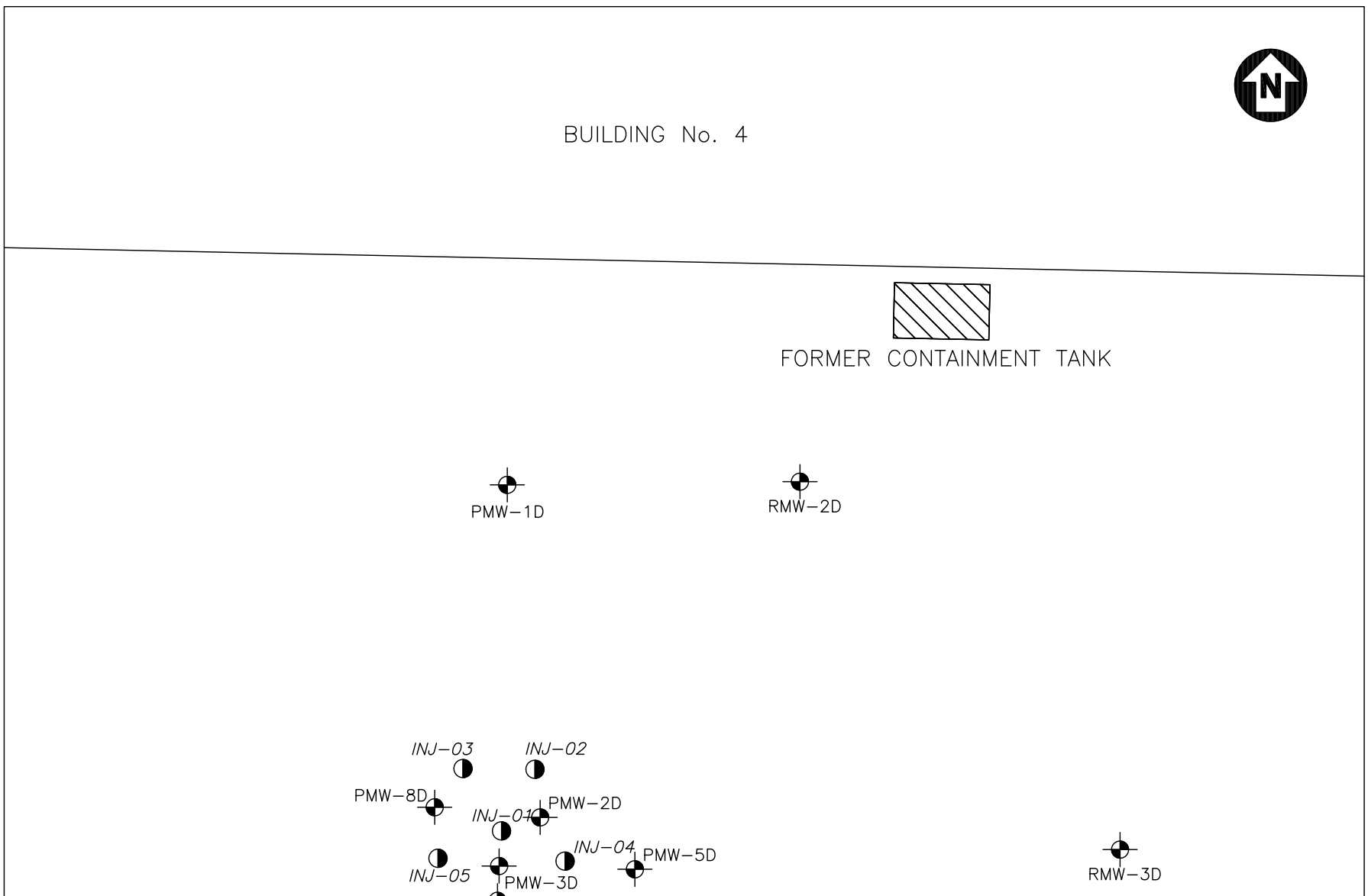


30 15 0 30 60

LEGEND:

PMW–1D MONITORING WELL

INJ–01 INJECTION WELL

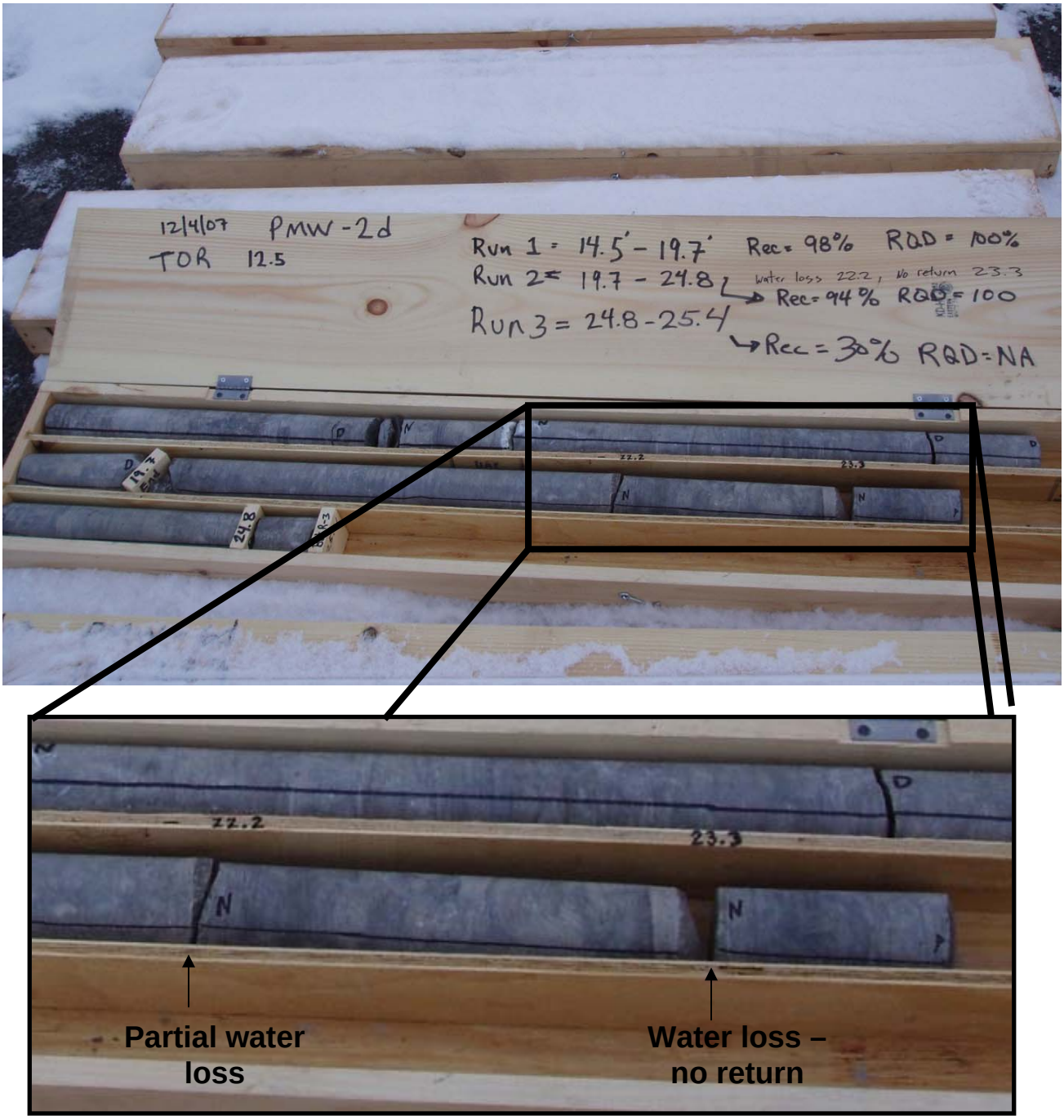
FIGURE 2.1

EKONOL POLYESTER
RESINS FACILITY
WHEATFIELD, NEW YORK

PILOT TEST INJECTION AND MONITORING WELL LOCATIONS

PARSONS
40 La Riviere Dr. Suite 350 Buffalo, NY 14202

P:\\\443970\cad\fig2_well_locs.dwg
No XREFs



NOTES: CORE IS APPROXIMATELY 2.5 INCHES IN DIAMETER

FIGURE 3.1

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NEW YORK

PHOTOGRAPH OF TYPICAL ROCK CORE

PARSONS
40 La Riviere Drive, Suite 350, Buffalo, New York 14202

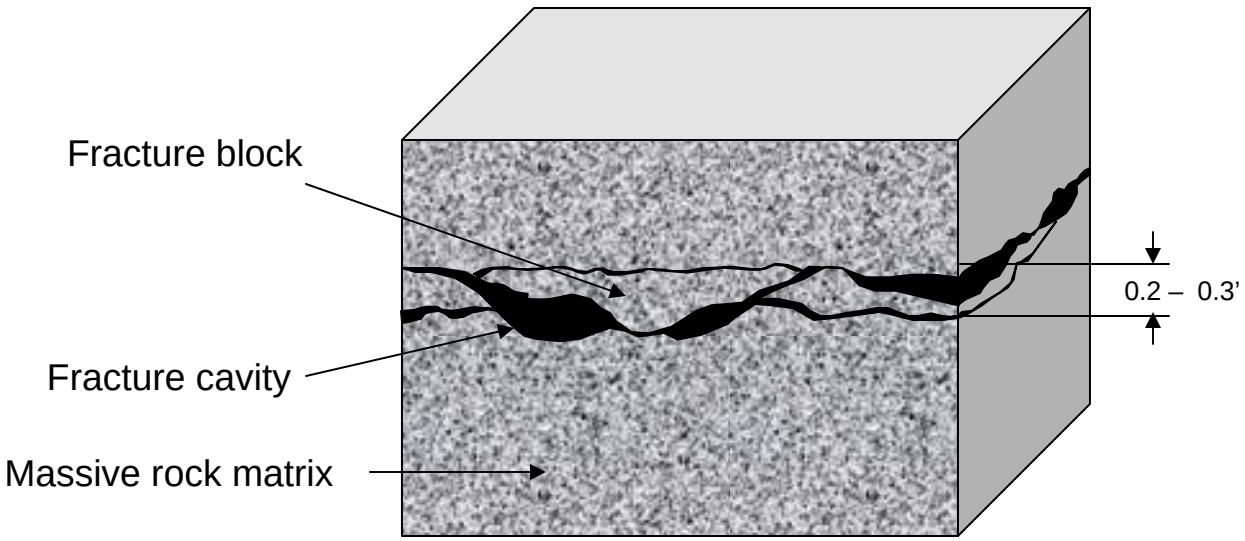
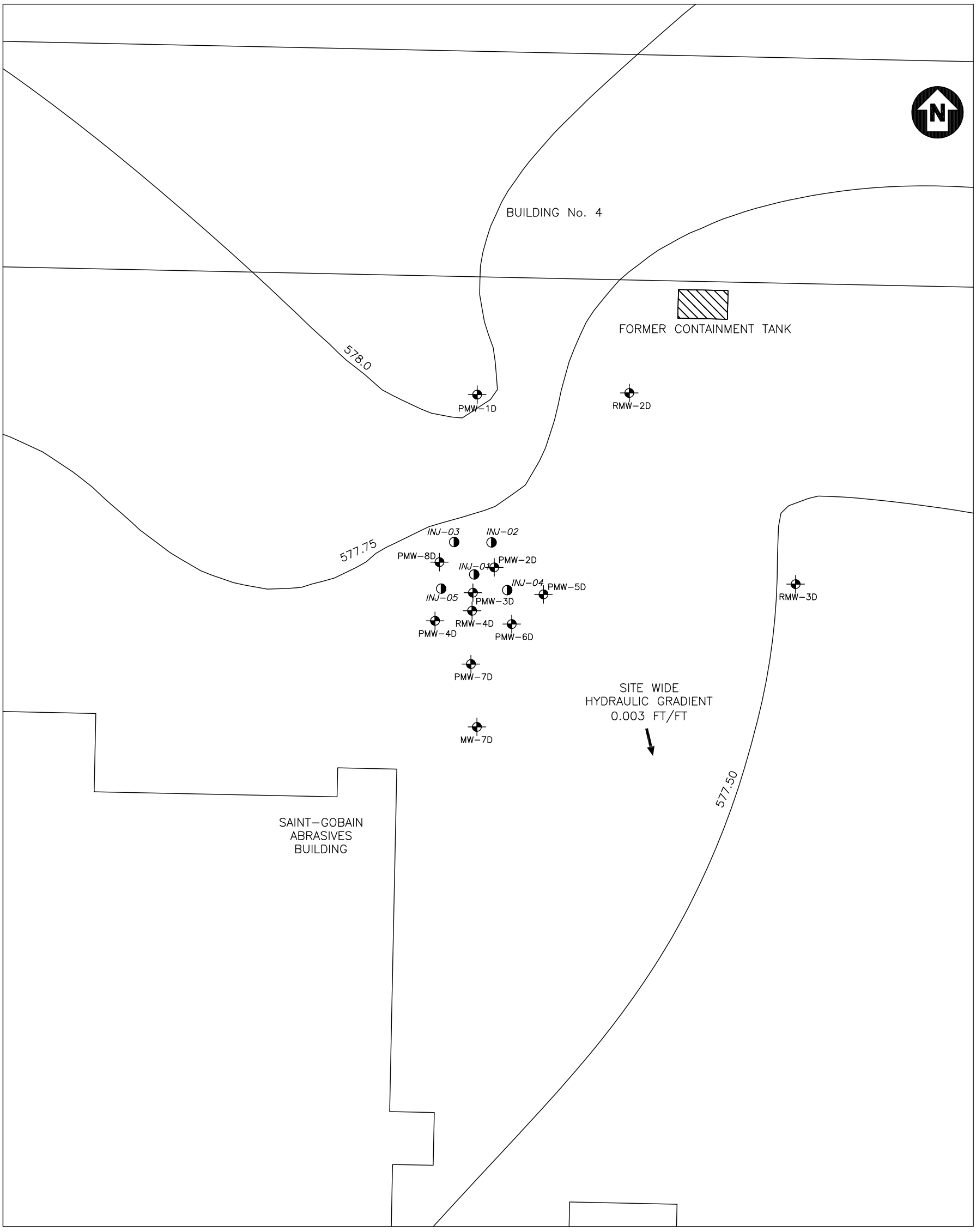


FIGURE 3.2

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NEW YORK

DIAGRAM OF FRACTURE CHARACTER

PARSONS
40 La Riviere Drive, Suite 350, Buffalo, New York 14202



Monitoring Well ID	Water Level Elevation 5/22/2008 (Feet)
RMW-2D	577.48
RMW-4D	577.54
INJ-01	577.69
INJ-02	577.69
INJ-03	577.71
INJ-04	577.69
INJ-05	577.67
PMW-1D	578.08
PMW-2D	577.70
PMW-3D	577.68
PMW-4D	577.68
PMW-5D	577.71
PMW-6D	577.70
PMW-7D	577.68
PMW-8D	577.67

LEGEND:

PMW–1D MONITORING WELL

INJ–01 INJECTION WELL

30 15 0 30 60

Note: The water table contours are based on, not only the pilot test wells but also the remainder of the deep wells onsite. Therefore the contour outside the wells shown here are interpolated, not extrapolated.

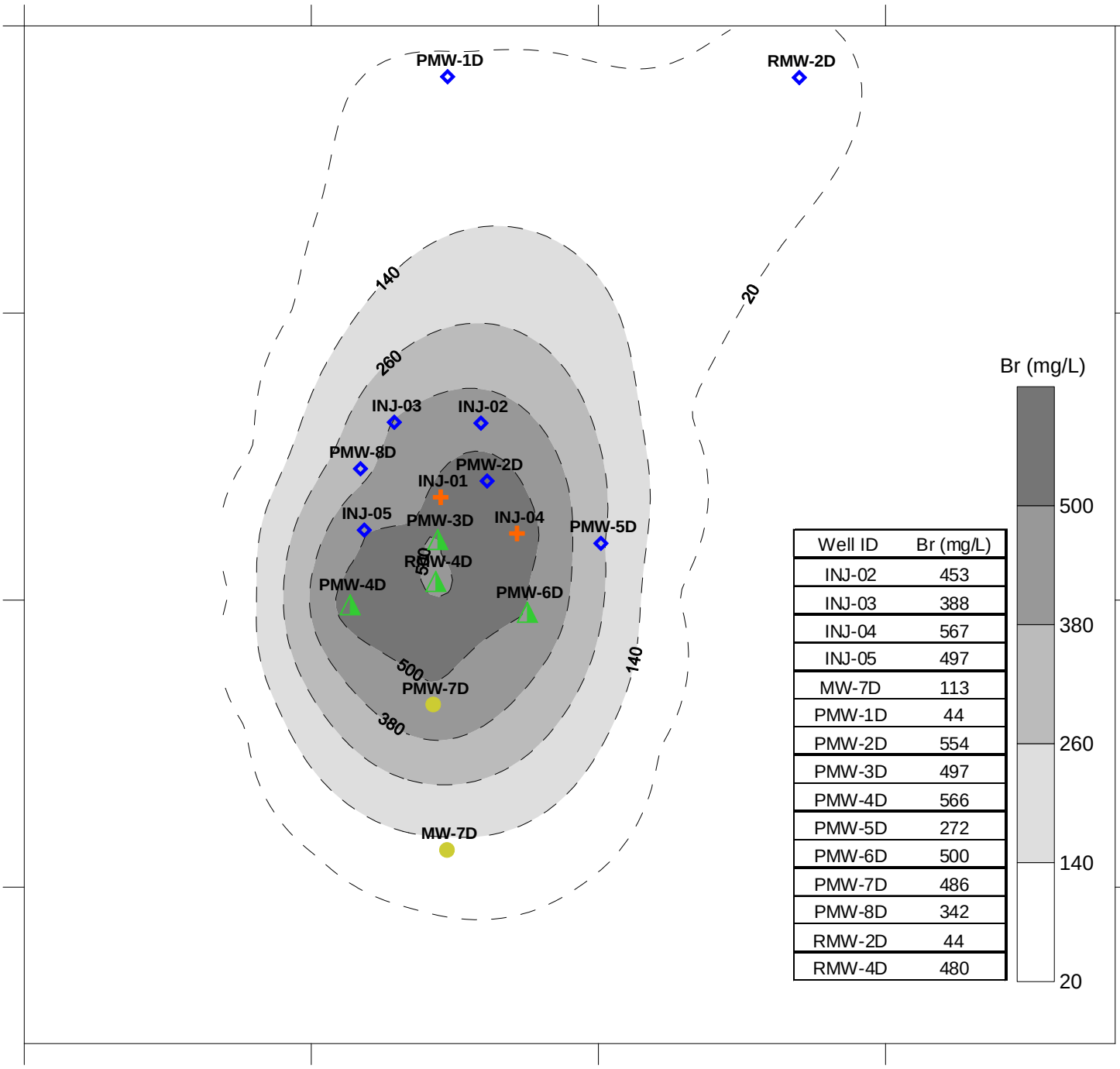
FIGURE 3.3

EKONOL POLYESTER
RESINS FACILITY
WHEATFIELD, NEW YORK

GROUNDWATER ELEVATION MAP DEEP WELLS

PARSONS
40 La Riviere Dr. Suite 350 Buffalo, NY 14202

P:\\\443970\cad\pilot_may_08_gmcont.dwg
No XREFs



Well ID	Br (mg/L)
INJ-02	453
INJ-03	388
INJ-04	567
INJ-05	497
MW-7D	113
PMW-1D	44
PMW-2D	554
PMW-3D	497
PMW-4D	566
PMW-5D	272
PMW-6D	500
PMW-7D	486
PMW-8D	342
RMW-2D	44
RMW-4D	480

LEGEND

0 10 20 30 40 50

FEET

- INJECTION WELL
- UP-GRADIENT OR SIDE-GRADIENT WELL
- DOWNGRADIENT WELL
- INNER TREATMENT ZONE WELL

BROMIDE CONCENTRATION IN MG/L

Notes:
Bromide was injected with the substrate as a conservative tracer. Concentration of bromide in the injection fluid was approximately 600 mg/L.

FIGURE 3.4

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NY

DISTRIBUTION OF BROMIDE IN GROUNDWATER FOLLOWING SUBSTRATE INJECTIONS

PARSONS
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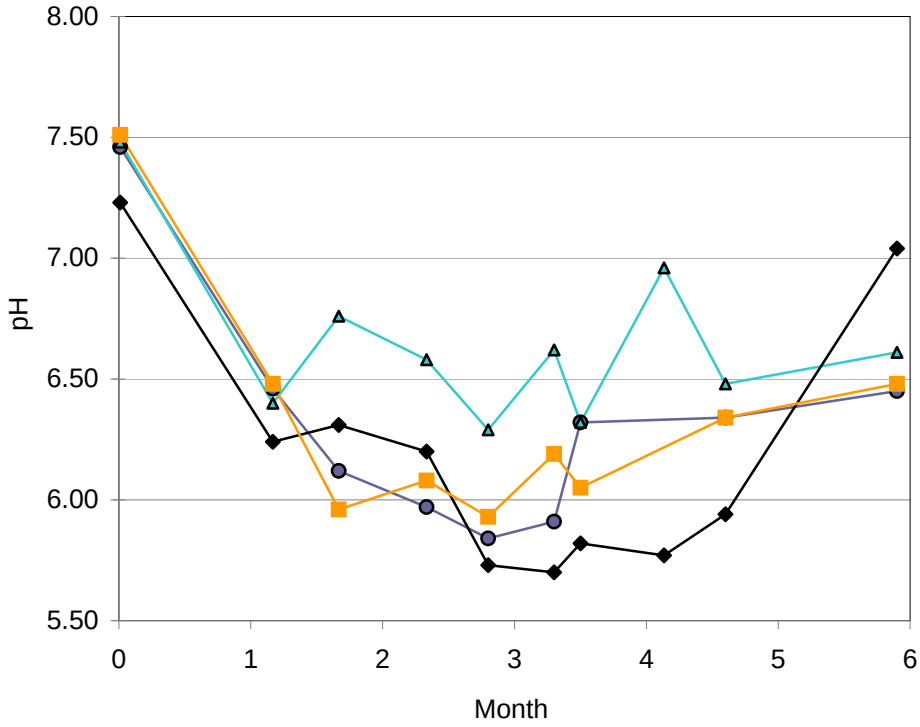
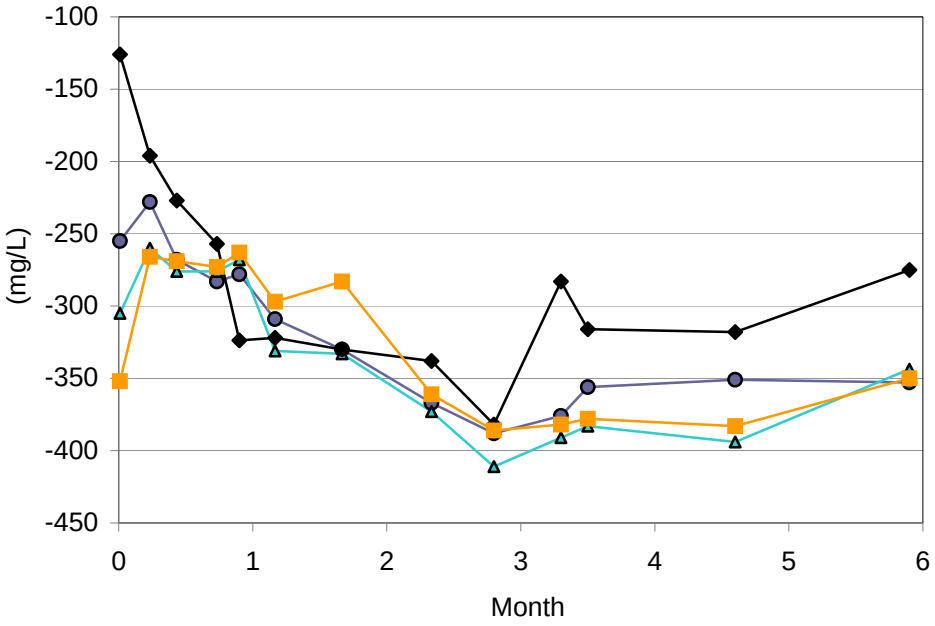
P:_443970_TECH_pilot test_monitoring_surfer_COND_TOC_BR.SRF



pH



ORP

PMW-3D

PMW-4D

PMW-6D

RMW-4D

FIGURE 3.5A

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NEW YORK

TRENDS OF GEOCHEMICAL PARAMETERS AT SELECTED MONITORING WELLS

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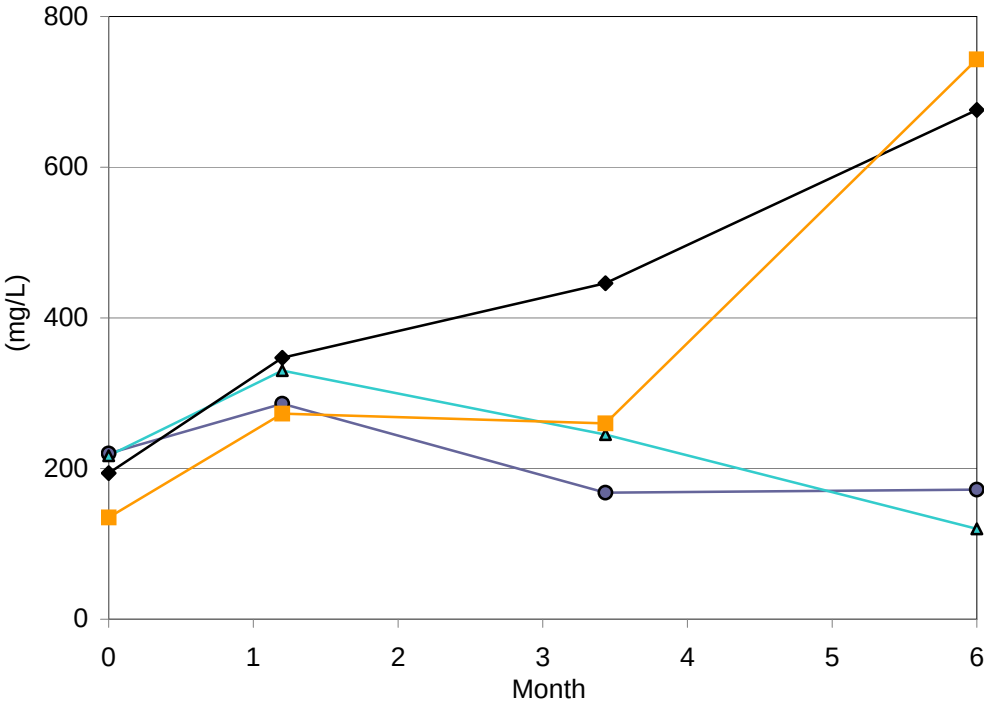
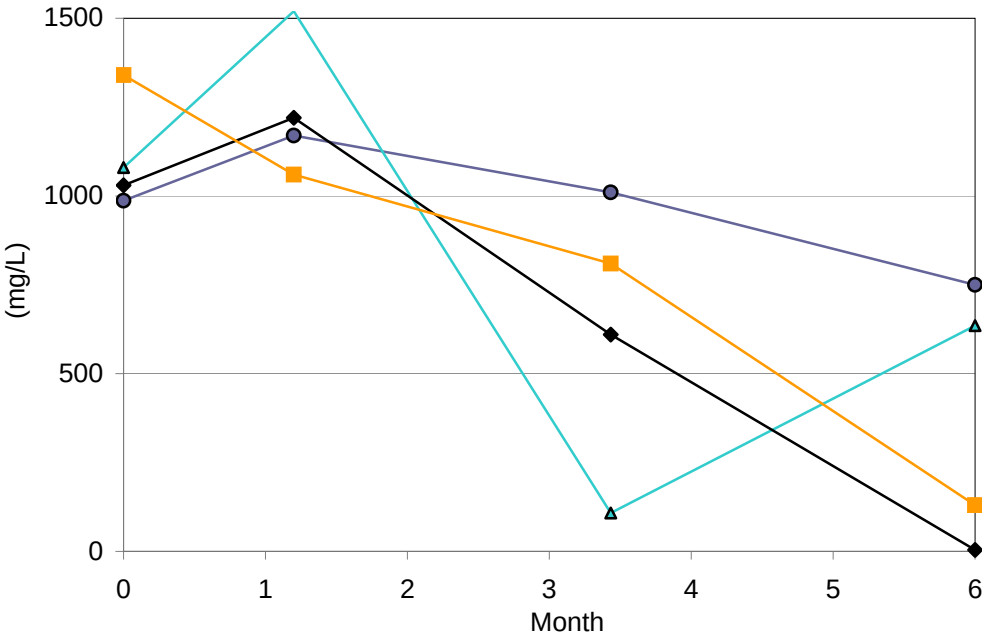


CHLORIDE



SULFATE

PMW-3D

PMW-4D

PMW-6D

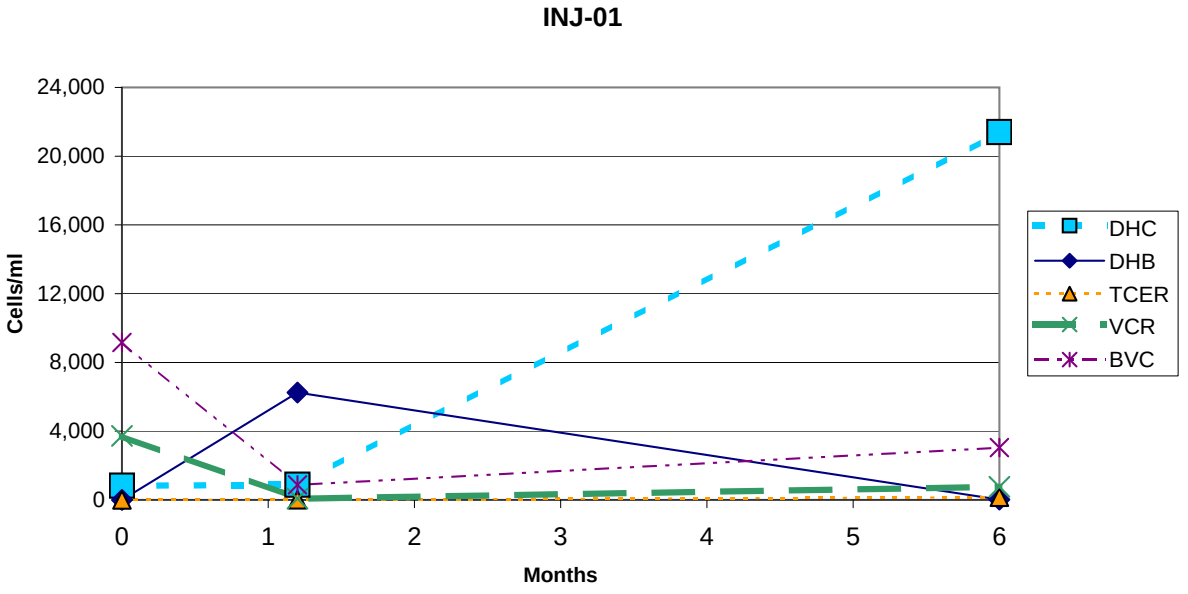
RMW-4D

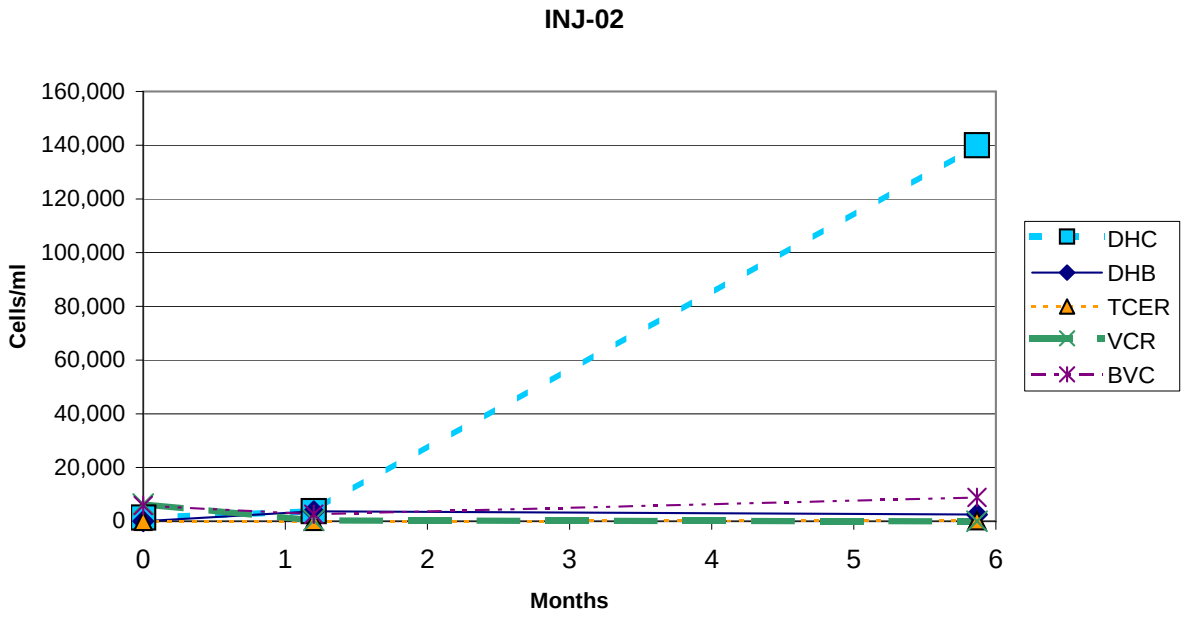
FIGURE 3.5B

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NEW YORK

TRENDS OF GEOCHEMICAL PARAMETERS AT SELECTED MONITORING WELLS

PARSONS
40 La Riviere Dr., Suite 350, Buffalo NY 14222





DHC - Dehalococcoides spp

DHB - Dehalobacter spp.

BVC R-DASE - BAV1 reductase gene

TCER R-DASE - TCE to cis-DCE **r**eductase gene

VCR R-DASE - vinyl chloride reductase gene

in strain VS and GT of Dehalococcoides.

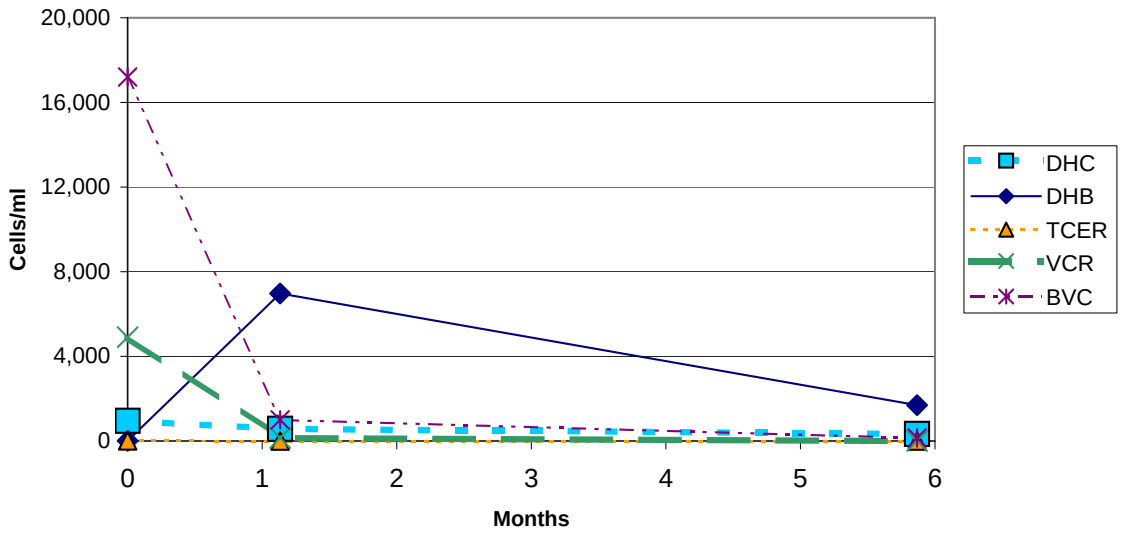
FIGURE 3.6 A

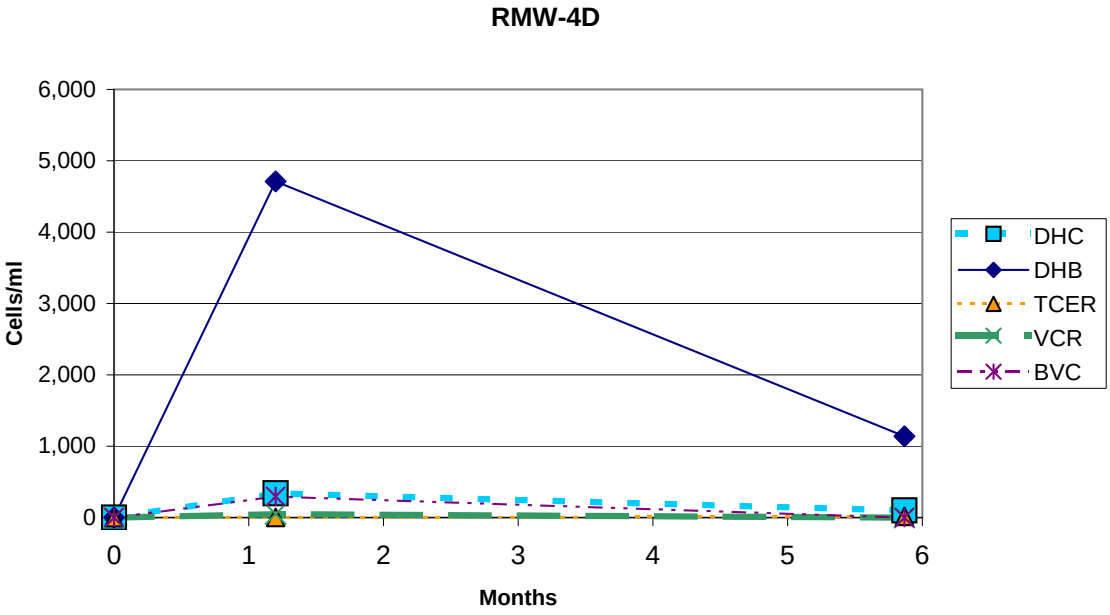
Ekonol Polyester Resins Facility
Wheatfield, New York

TRENDS OF MICROBIAL POPULATIONS

PARSONS

40 La Riviere Dr., Suite 350, Buffalo NY 14222





DHC - Dehalococcoides spp

DHB - Dehalobacter spp.

BVC R-DASE - BAV1 reductase gene

TCER R-DASE - TCE to cis-DCE reductase gene

VCR R-DASE - vinyl chloride reductase gene

in strain VS and GT of Dehalococcoides.

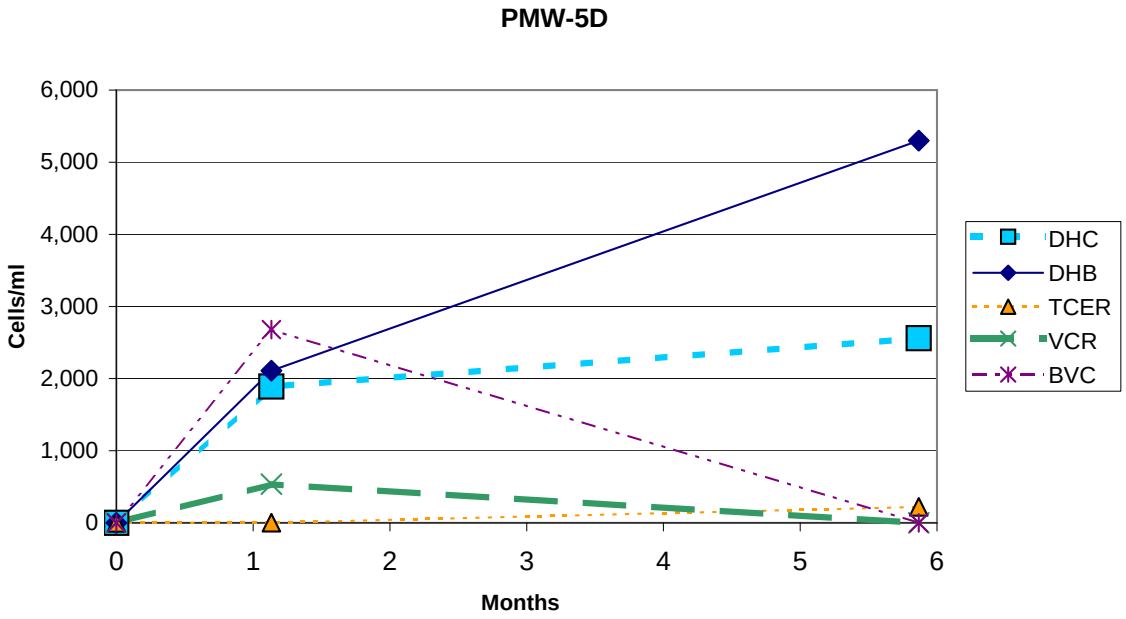
FIGURE 3.6 B

Ekonol Polyester Resins Facility
Wheatfield, New York

TRENDS OF MICROBIAL POPULATIONS

PARSONS

40 La Riviere Dr., Suite 350, Buffalo NY 14222



DHC - Dehalococcoides spp

DHB - Dehalobacter spp.

BVC R-DASE - BAV1 reductase gene

TCER R-DASE - TCE to cis-DCE reductase gene

VCR R-DASE - vinyl chloride reductase gene

in strain VS and GT of Dehalococcoides.

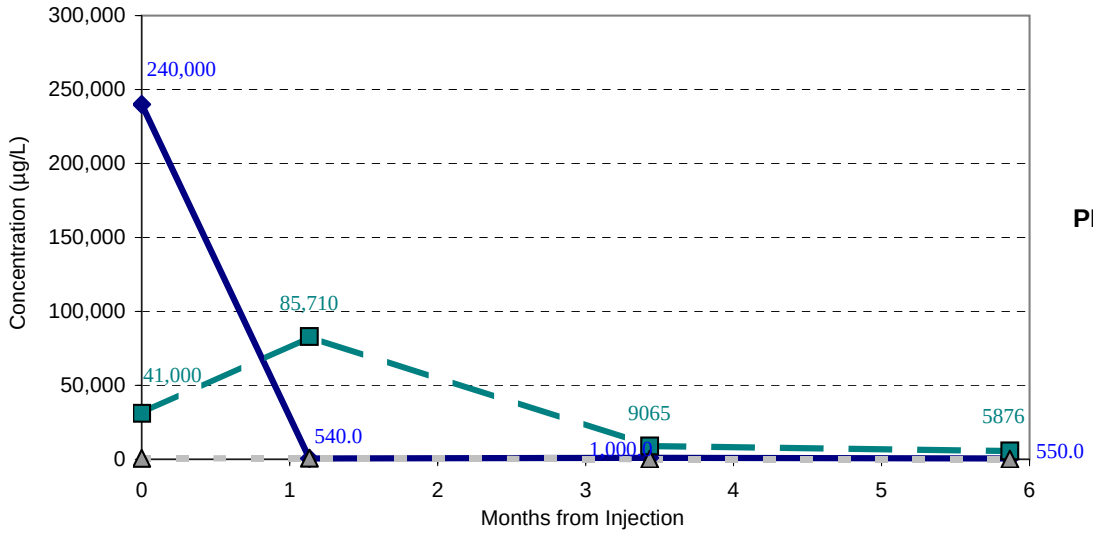
FIGURE 3.6 C

Ekonol Polyester Resins Facility
Wheatfield, New York

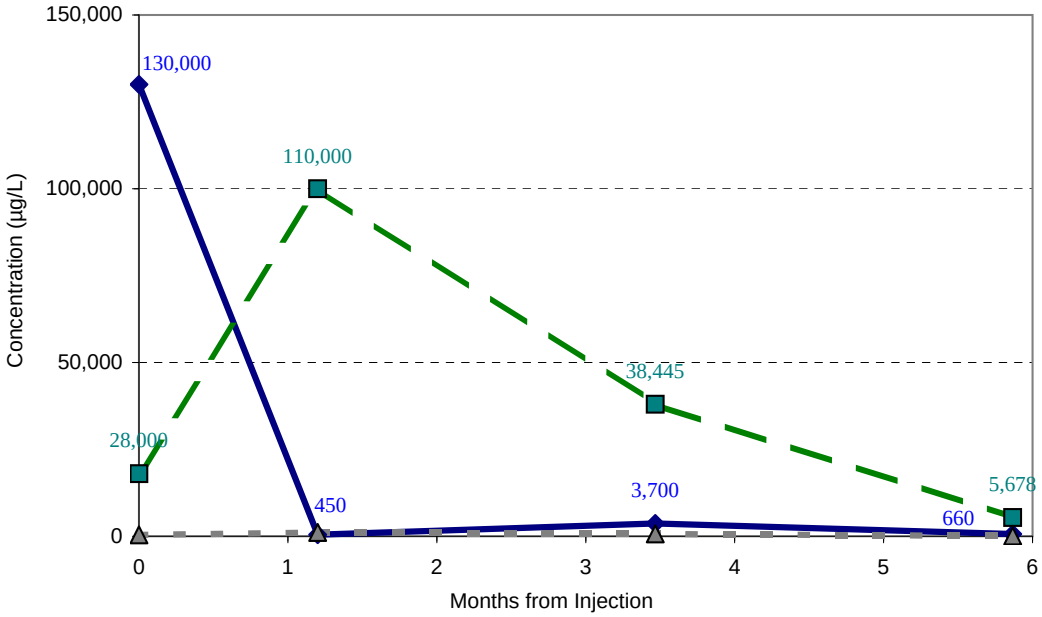
TRENDS OF MICROBIAL POPULATIONS

PARSONS

40 La Riviere Dr., Suite 350, Buffalo NY 14222



PMW-3D



RMW-4D

TCE

cis-1,2-DCE

VC

FIGURE 3.7 A

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NEW YORK

TRENDS OF CHLORINATED ETHENES - INNER TREATMENT ZONE WELLS

PARSONS

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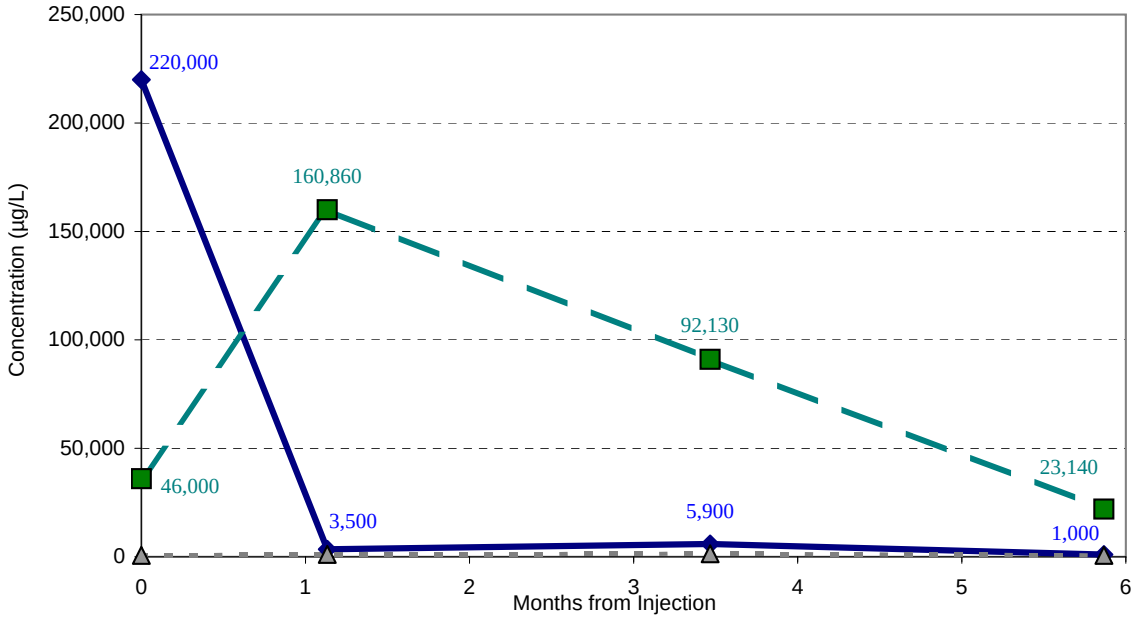
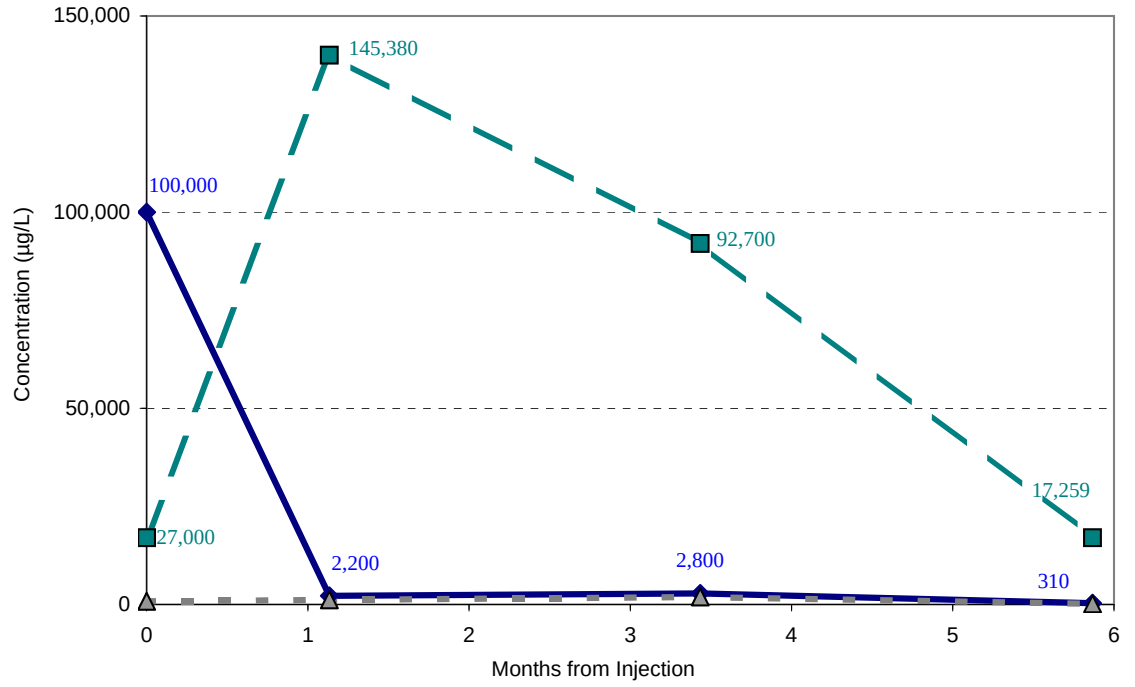


PMW-4D



PMW-6D

TCE

cis-1,2-DCE

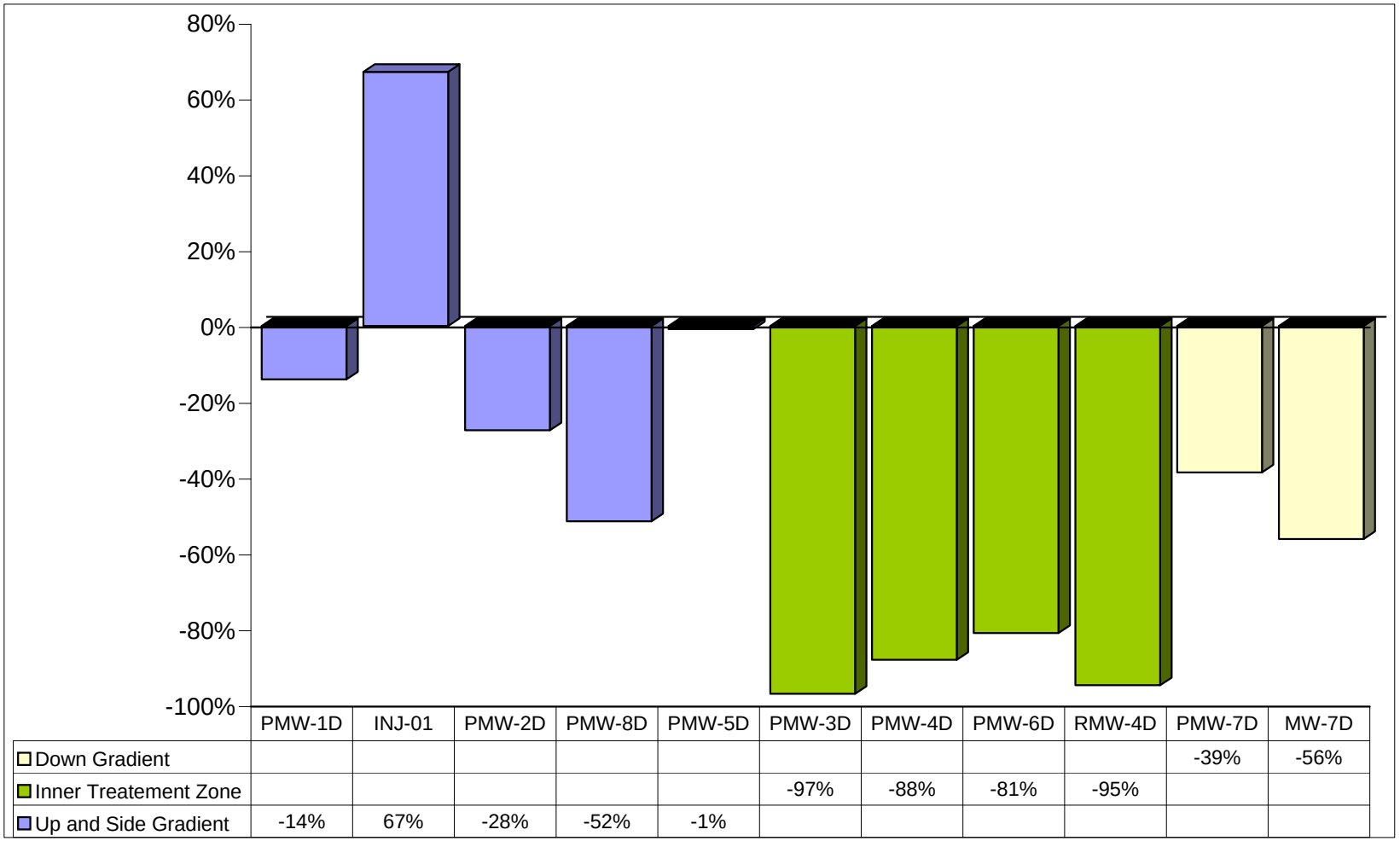
VC

FIGURE 3.7 B

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NEW YORK

TRENDS OF CHLORINATED ETHENES - INNER TREATMENT ZONE WELLS

PARSONS
40 La Riviere Dr., Suite 350, Buffalo NY 14222



	PMW-1D	INJ-01	PMW-2D	PMW-8D	PMW-5D	PMW-3D	PMW-4D	PMW-6D	RMW-4D	PMW-7D	MW-7D
Down Gradient										-39%	-56%
Inner Treatement Zone						-97%	-88%	-81%	-95%		
Up and Side Gradient	-14%	67%	-28%	-52%	-1%						

FIGURE 3.8

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NEW YORK

PERCENT CHANGE IN THE TOTAL MOLAR CHLORINATED ETHENES DURING THE PILOT TEST

PARSONS
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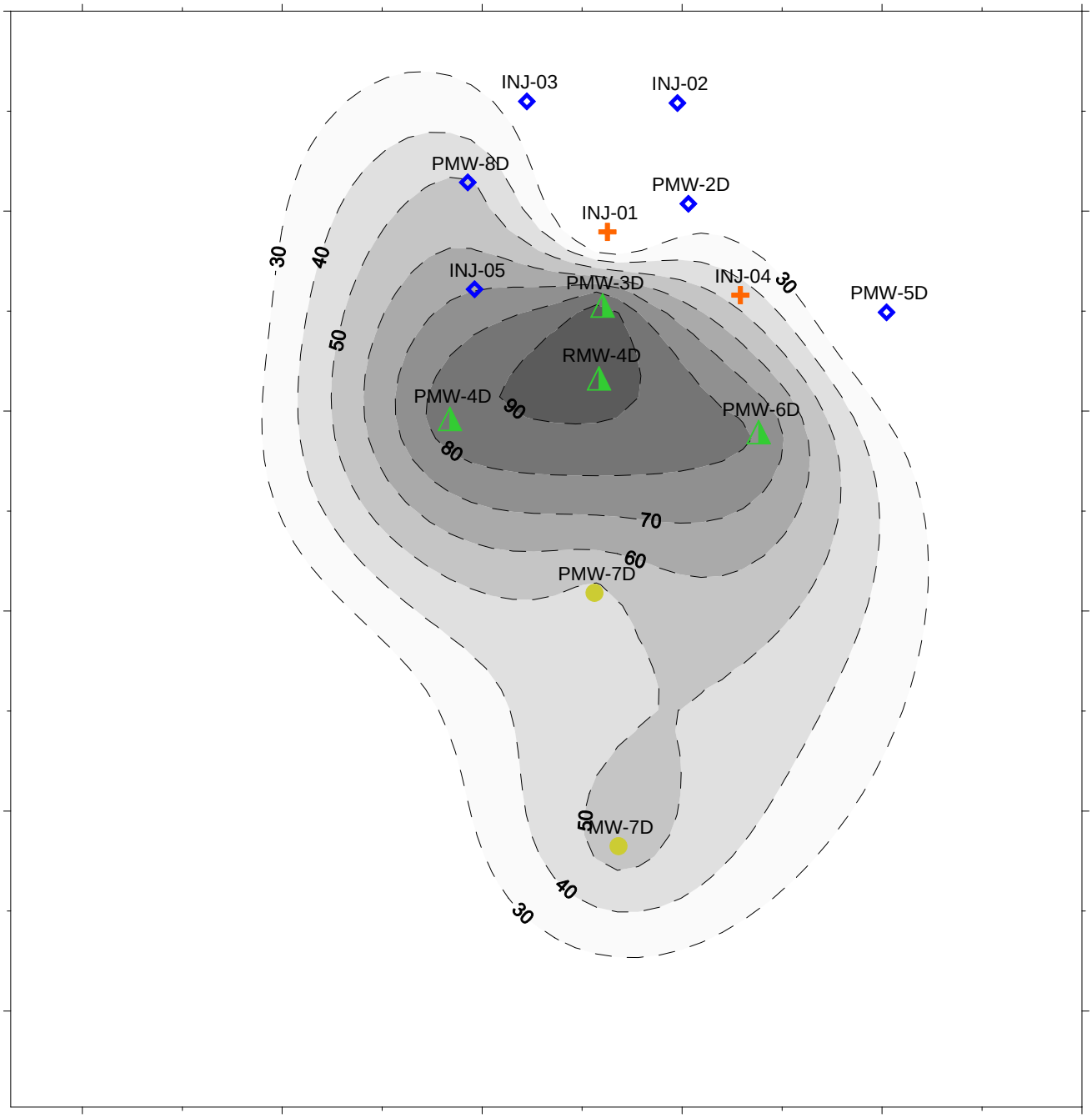


LEGEND

- INJECTION WELL
- UP-GRADIENT OR SIDE-GRADIENT WELL
- DOWNGRADIENT WELL
- INNER TREATMENT ZONE WELL

CONTOUR INTERVAL = 10%

PERCENT DECREASE AT INJ-01 WAS LESS THAN ZER0, I.E. INCREASE IN COCS

PERCENT CHANGE IN SUM OF TCE, CIS-1,1 DCE, AND VC, BETWEEN THE BASELINE EVENT AND THE SIX-MONTH EVENT

FIGURE 3.9

EKONOL POLYESTER RESINS FACILITY
WHEATFIELD, NY

PERCENT DECREASE IN TOTAL MOLAR CHLORINATED ETHENES

PARSONS
40 La Riviere Dr., Suite 350, Buffalo, NY 14202

P:_443970_TECH_pilot test_monitoring_surfer_COND_TOC_change_cocs.SRF

TABLES

TABLE 2.1

SUMMARY OF MONITORING WELL CONSTRUCTION

Well/Borehole Identification	Zone	Completion Date	Screened or Open Rock Well	Well Diameter (inches)	Wells Interval (feet bgs)[a/]	Fracture zone Interval (feet bgs)	Elevation Top of Casing[c/] (feet amsl)	Survey Easting[d/] (feet)	Survey Northing[d/] (feet)
Injection Wells									
INJ-01	Injection	19-Nov-07	Open Rock	4.0[e/]	14.5 - 25.8	21.5 - 23	585.70	1056172.53	1132217.92
INJ-02	Upgradient	28-Nov-07	Open Rock	4.0[e/]	15 - 25.6	21.9 - 22.9	585.54	1056179.53	1132230.81
INJ-03	Upgradient	28-Nov-07	Open Rock	4.0[e/]	13.2 - 24.9	22.4 - 23.4	585.35	1056164.47	1132230.97
INJ-04	Injection	27-Nov-07	Open Rock	4.0[e/]	14.5 - 25.6	20.5 - 22.8	585.58	1056185.83	1132211.60
INJ-05	Side Gradient	21-Nov-07	Open Rock	4.0[e/]	11.0 - 26.0	22.3 - 23.4	585.60	1056159.24	1132212.19
Monitoring Wells									
PMW-1D	Upgradient	20-Nov-07	Screened	2.0	16.5 - 23.5	22-25	585.66	1056173.74	1132291.16
PMW-2D	Upgradient	19-Nov-07	Screened	2.0	14.5 - 25.4	22.2 - 23.3	585.85	1056180.62	1132220.74
PMW-3D	Treatment	20-Nov-07	Screened	2.0	14.5 - 25.8	21.9 - 25.8	585.98	1056172.04	1132210.57
PMW-4D	Treatment	26-Nov-07	Screened	2.0	14.5 - 26.0	21.7 - 23.2	585.73	1056156.77	1132199.23
PMW-5D	Side Gradient	3-Dec-07	Screened	2.0	15 - 25.9	23.5 -24.0	585.73	1056200.45	1132209.88
PMW-6D	Treatment	27-Nov-07	Screened	2.0	15.0 - 25.9	23.5 - 23.7	585.86	1056187.65	1132197.91
PMW-7D	Upgradient	19-Nov-07	Screened	2.0	14.0 - 25.3	23.5	585.82	1056171.23	1132181.82
PMW-8D	Upgradient	27-Nov-07	Screened	2.0	14.5 - 25.6	22.5 - 23.4	585.46	1056158.56	1132222.87
Existing Wells									
RMW-4D	Treatment	24-Oct-03	Screened	2.0	15.0 - 32.5	23.0 - 23.8	585.76	1056171.69	1132203.28
MW-7D	Downgradient	3-Oct-06	Open Rock	4.0[e/]	15.4 - 30.4	23.4	585.84	1056173.63	1132156.49

[a/] feet bgs indicates depth in feet below ground surface.
[b/] feet amsl indicates elevation in feet above mean sea level.
[c/] Vertical coordinates in feet relative to North American Vertical Datum of 1929 (NAVD29).
[d/] Horizontal Datum = North American Vertical Datum (NAD) 1983/96, Projection = New York West Zone, Units U.S. Survey Feet
[e/] Nominal dimension

TABLE 2.2
SUMMARY OF SUBSTRATE INJECTION AND LOADING RATES

Injection Points			Substrate Injection Mixture						Post-Emulsion Push	Total Volume		Approximate Injection Parameters	
Well ID	Injection Interval (feet)	Injection Spacing (feet)	Emulsion Volume (gallons)	Product Weight (pounds)	Vegetable Oil Component (gallons)	Vegetable Oil Component (pounds)	Lactic Acid Component (pounds)	Makeup Water (gallons)	Makeup Water (gallons)	Substrate (pounds)	Water/ Substrate (gallons)	Injection Interval (feet)	Effective Porosity (percent)
Injection Wells													
INJ01	14.5 - 25.8	15	83	660	51	396	21.2	450	35	417	568	10	1%
INJ02	14.5 - 25.6	15	83	660	51	396	21.2	450	35	417	568	10	1%
SUBTOTAL:			**166**	**1,320**	**102**	**792**	**42**	**900**	**70**	**835**	**1,136**		

Weight Emulsion Product (lbs): **1,320**

SUBSTRATE LOADING RATES

Substrate Lactic Acid Concentration:	4,489	milligrams per liter		
Substrate Oil Concentration:	83,761	milligrams per liter	Residual Percent Oil in Substrate Mixture:	8.9%

NOTES: Vegetable Oil Emulsion Product

1. Emulsion product is 60 percent soybean oil by weight.
2. Vegetable oil/emulsifier mix is 7.8 pounds per gallon.

TABLE 3.1

SUMMARY OF WATER LEVEL MEASUREMENTS

Well ID	Depth to Water 1/14/2008 (Feet BTOC)	Water Elevation 1/14/2008 (Feet)	Depth to Water 5/22/2008 (Feet BTOC)	Water Elevation 5/22/2008 (Feet)	Depth to Water 6/25/2008 (Feet BTOC)	Water Elevation 6/25/2008 (Feet)	Depth to Water 7/1/2008 (Feet BTOC)	Water Elevation 7/1/2008 (Feet)
INJ-01	6.71	578.99	8.01	577.69	8.02	577.68	8.01	577.69
INJ-02	6.54	579.00	7.85	577.69	7.78	577.76	7.81	577.73
INJ-03	6.33	579.02	7.64	577.71	7.60	577.75	7.59	577.76
INJ-04	6.59	578.99	7.89	577.69	7.96	577.62	7.89	577.69
INJ-05	6.62	578.98	7.93	577.67	7.88	577.72	7.88	577.72
PMW-1D	6.55	579.11	7.58	578.08	7.51	578.15	7.92	577.74
PMW-2D	6.84	579.01	8.15	577.70	8.05	577.80	8.09	577.76
PMW-3D	6.99	578.99	8.30	577.68	8.22	577.76	8.20	577.78
PMW-4D	6.74	578.99	8.05	577.68	7.96	577.77	8.05	577.68
PMW-5D	6.73	579.00	8.02	577.71	7.97	577.76	7.98	577.75
PMW-6D	6.90	578.96	8.16	577.70	8.09	577.77	8.10	577.76
PMW-7D	6.84	578.98	8.14	577.68	7.09	578.73	8.14	577.68
PMW-8D	6.48	578.98	7.79	577.67	7.75	577.71	7.78	577.68
MW-7D	6.85	578.99	8.15	577.69	8.19	577.65	7.16	578.68
RMW-2D	6.41	579.43	8.66	577.18	7.70	578.14	NM	NM
RMW-3D	6.81	578.90	8.12	577.59	NM	NM	NM	NM
RMW-4D	6.88	578.88	8.22	577.54	7.97	577.79	8.00	577.76

NM - NOT MEASURED

HORIZONTAL. DATUM - NAD 83/96, VERT. DATUM, PROJECTION NEW YORK WEST ZONE - NGVD 29, UNITS - U.S. SURVEY FEET

TABLE 3.2
LABORATORY RESULTS FOR GEOCHEMICAL PARAMETERS

Well ID	Date	Months from Injection	Total Organic Carbon mg/l	Arsenic mg/l	Manganese mg/l	Selenium mg/l	Chloride mg/l	Bromide mg/l
INJ-01	15-Jan-08	Baseline	6	#N/A	#N/A	#N/A	229	*1 U*
	24-Jul-08	1.2	202 J	#N/A	#N/A	#N/A	335 J	6.64 J
	29-Sep-08	3.4	333	#N/A	#N/A	#N/A	539	4
	15-Dec-08	6.0	441	#N/A	#N/A	#N/A	564	5
PMW-1D	15-Jan-08	Baseline	12	*0.01 U*	0	*0.01 U*	265	1
	25-Jul-08	1.2	22.4 J	*0.01 UJ*	0.479 J	*0.01 UJ*	424 J	2.04 J
	1-Oct-08	3.5	33	*0.01 U*	0	*0.01 U*	833	*1 U*
	11-Dec-08	5.9	45	*0.01 U*	0	*0.01 U*	482	2
PMW-2D	16-Jan-08	Baseline	8	#N/A	#N/A	#N/A	230	*1 U*
	23-Jul-08	1.2	1020	#N/A	#N/A	#N/A	358	22
	29-Sep-08	3.4	748	#N/A	#N/A	#N/A	552	9
	11-Dec-08	5.9	194	#N/A	#N/A	#N/A	442	17
PMW-3D	15-Jan-08	Baseline	11	*0.01 U*	0	*0.01 U*	220	*1 U*
	22-Jul-08	1.1	1800	*0.01 U*	0	*0.01 U*	286	11
	29-Sep-08	3.4	558	*0.01 U*	0	*0.01 U*	168	5
	11-Dec-08	5.9	204	*0.01 U*	0	*0.01 U*	172	2
PMW-4D	16-Jan-08	Baseline	12	*0.01 U*	0	*0.01 U*	217	*1 U*
	22-Jul-08	1.1	237	*0.01 U*	1	*0.01 U*	330	10
	30-Sep-08	3.5	227	*0.01 U*	0	*0.01 U*	245	4
	11-Dec-08	5.9	113	*0.01 U*	0	*0.01 U*	120	2
PMW-5D	15-Jan-08	Baseline	5	#N/A	#N/A	#N/A	189	*1 U*
	22-Jul-08	1.1	332	#N/A	#N/A	#N/A	273	9
	29-Sep-08	3.4	383	#N/A	#N/A	#N/A	977	4
	11-Dec-08	5.9	196	#N/A	#N/A	#N/A	216	3
PMW-6D	14-Jan-08	Baseline	7	#N/A	#N/A	#N/A	194	*1 U*
	22-Jul-08	1.1	627	#N/A	#N/A	#N/A	347	27
	29-Sep-08	3.4	565	#N/A	#N/A	#N/A	446	6
	11-Dec-08	5.9	266	#N/A	#N/A	#N/A	676	1
PMW-7D	16-Jan-08	Baseline	9	*0.01 U*	0	*0.01 U*	226	*1 U*
	24-Jul-08	1.2	417 J	*0.01 UJ*	0.497 J	*0.01 UJ*	288 J	20.5 J
	30-Sep-08	3.5	531	*0.01 U*	0	*0.01 U*	219	5
	11-Dec-08	5.9	476	*0.01 U*	0	*0.01 U*	213	5
PMW-8D	14-Jan-08	Baseline	11	#N/A	#N/A	#N/A	222	1
	23-Jul-08	1.2	551	#N/A	#N/A	#N/A	320	21
	29-Sep-08	3.4	190	#N/A	#N/A	#N/A	283	5
	11-Dec-08	5.9	263	#N/A	#N/A	#N/A	254	4
MW-7D	15-Jan-08	Baseline	8	*0.01 U*	0	*0.01 U*	206	*0 U*
	25-Jul-08	1.2	480 J	*0.01 UJ*	0.723 J	*0.01 UJ*	330 J	25.2 J
	30-Sep-08	3.5	212	*0.01 U*	1	*0.01 U*	260	4
	11-Dec-08	5.9	278	*0.01 U*	1	*0.01 U*	232	4
RMW-4D	15-Jan-08	Baseline	8	#N/A	#N/A	#N/A	135	1
	24-Jul-08	1.2	387 J	#N/A	#N/A	#N/A	273 J	8.82 J
	30-Sep-08	3.5	294	#N/A	#N/A	#N/A	260	3
	11-Dec-08	5.9	168	#N/A	#N/A	#N/A	743	2

ITALICIZED VALUES REPRESENTS DETECTION LIMIT WHEN THE PARAMETER WAS NOT DETECTED

INJECTION OF SUBSTRATE WAS COMPLETED ON 18-JUNE-08

µg/L - MICROGRAMS PER LITER

mg/L - MILLIGRAMS PER LITER

J = ESTIMATED VALUE

U = BELOW DETECTION LIMITS

UJ = ESTIMATED NON-DETECT POSSIBLY BIASED LOW

E - EXCEEDANCE

#NA - Well was not sampled for this parameter

TABLE 3.2
LABORATORY RESULTS FOR GEOCHEMICAL PARAMETERS

Well ID	Date	Months from Injection	Sulfate mg/l	Acetic Acid mg/l	Butyric Acid mg/l	Lactic Acid mg/l	Propionic Acid mg/l	Pyruvic Acid mg/l	Total Volatile Fatty Acids mg/l
INJ-01	15-Jan-08	Baseline	1480	*1 U*	*2 U*	*1 U*	*1 U*	*0.5 U*	*<5.5 U*
	24-Jul-08	1.2	1150 J	160 J	17 J	*1 UJ*	140 J	*0.5 UJ*	319
	29-Sep-08	3.4	917	310	35	*1 U*	130	*0.5 U*	477
	15-Dec-08	6.0	260	340	120	*2 U*	160	*1 U*	623
PMW-1D	15-Jan-08	Baseline	1460	*1 U*	*2 U*	*1 U*	*1 U*	*0.5 U*	*<5.5 U*
	25-Jul-08	1.2	2200 J	33 J	*2 UJ*	*1 UJ*	1.6 J	*0.5 UJ*	38
	1-Oct-08	3.5	1210	22	3	1	7	*0.5 U*	33
	11-Dec-08	5.9	1530	20	*2 U*	*1 U*	6	*0.5 U*	30
PMW-2D	16-Jan-08	Baseline	1410	*1 U*	*2 U*	*1 U*	*1 U*	*0.5 U*	*<5.5 U*
	23-Jul-08	1.2	1250	210	32	*1 U*	260	*0.5 U*	504
	29-Sep-08	3.4	843	370	73	*1 U*	240	*0.5 U*	685
	11-Dec-08	5.9	270	560	210	*5 U*	320	*2.5 U*	778
PMW-3D	15-Jan-08	Baseline	987	*1 U*	*2 U*	*1 U*	*1 U*	*0.5 U*	*<5.5 U*
	22-Jul-08	1.1	1170	170	24	*1 U*	170	*0.5 U*	366
	29-Sep-08	3.4	1010	140	48	7	75	*0.5 U*	270
	11-Dec-08	5.9	750	140	56	*1 U*	42	*0.5 U*	240
PMW-4D	16-Jan-08	Baseline	1080	*1 U*	*2 U*	*1 U*	*1 U*	*0.5 U*	*<5.5 U*
	22-Jul-08	1.1	1520	180	13	*1 U*	190	*0.5 U*	385
	30-Sep-08	3.5	108	170	12	*1 U*	55	*0.5 U*	239
	11-Dec-08	5.9	635	150	*2 U*	*1 U*	12	*0.5 U*	166
PMW-5D	15-Jan-08	Baseline	710	*1 U*	*2 U*	*1 U*	*1 U*	*0.5 U*	*<5.5 U*
	22-Jul-08	1.1	982	170	15	*1 U*	120	*0.5 U*	307
	29-Sep-08	3.4	730	370	28	*1 U*	130	*0.5 U*	530
	11-Dec-08	5.9	352	230	24	*2 U*	54	*1 U*	311
PMW-6D	14-Jan-08	Baseline	1030	*1 U*	*2 U*	*1 U*	*1 U*	*0.5 U*	*<5.5 U*
	22-Jul-08	1.1	1220	210	32	*1 U*	240	*0.5 U*	484
	29-Sep-08	3.4	610	510	52	*1 U*	200	*0.5 U*	764
	11-Dec-08	5.9	4	180	37	*1 U*	26	*0.5 U*	245
PMW-7D	16-Jan-08	Baseline	1170	*1 U*	*2 U*	*1 U*	*1 U*	*0.5 U*	*<5.5 U*
	24-Jul-08	1.2	984 J	290 J	17 J	*1 UJ*	300 J	*0.5 UJ*	609
	30-Sep-08	3.5	724	660	51	*1 U*	190	*0.5 U*	903
	11-Dec-08	5.9	72	560	18	*5 U*	51	*2.5 U*	637
PMW-8D	14-Jan-08	Baseline	1590	*1 U*	*2 U*	*1 U*	*1 U*	*0.5 U*	*<5.5 U*
	23-Jul-08	1.2	1810	170	14	*1 U*	160	*0.5 U*	346
	29-Sep-08	3.4	2410	200	13	*1 U*	70	*0.5 U*	285
	11-Dec-08	5.9	1210	230	37	*2 U*	39	*1 U*	309
MW-7D	15-Jan-08	Baseline	1150	*1 U*	*2 U*	*1 U*	*1 U*	*0.5 U*	*<5.5 U*
	25-Jul-08	1.2	1190 J	280 J	16 J	*1 UJ*	390 J	*0.5 UJ*	688
	30-Sep-08	3.5	1280	320	6	*1 U*	59	*0.5 U*	386
	11-Dec-08	5.9	649	420	*10 U*	*5 U*	45	*2.5 U*	483
RMW-4D	15-Jan-08	Baseline	1340	*1 U*	*2 U*	*1 U*	*1 U*	*0.5 U*	*<5.5 U*
	24-Jul-08	1.2	1060 J	210 J	13 J	*1 UJ*	190 J	*0.5 UJ*	415
	30-Sep-08	3.5	810	340	27	*1 U*	120	*0.5 U*	489
	11-Dec-08	5.9	130	74	18	*1 U*	34	*0.5 U*	128

ITALICIZED VALUES REPRESENTS DETECTION LIMIT WH

INJECTION OF SUBSTRATE WAS COMPLETED ON 18-JUNE

µg/L - MICROGRAMS PER LITER

mg/L - MILLIGRAMS PER LITER

J = ESTIMATED VALUE

U = BELOW DETECTION LIMITS

UJ = ESTIMATED NON-DETECT POSSIBLY BIASED LOW

E - EXCEEDANCE

#NA - Well was not sampled for this parameter

TABLE 3.3
RESULTS OF FIELD LABORATORY MEASUREMENTS

Well ID	Date	Ferrous Iron mg/L	Manganese mg/L	Carbon Dioxide mg/L	Hydrogen Sulfide mg/L	Alkalinity (as $CaCO_3$)[a/] mg/L
INJ-01	Jan-08	1	<0.1	382	0.1	340
	Jul-08	3	0.2	1600	1.8	680
	Sep-08	NM	NM	NM	NM	760
	Oct-08	<0.1	3	5500	5	480
	Dec-08	<0.1	2.2	5500	<0.01	800
INJ-02	Jan-08	NM	<0.1	NM	NM	NM
	Jul-08	4	<0.1	1600	2.1	700
	Sep-08	NM	NM	NM	NM	800
	Oct-08	NM	NM	NM	NM	NM
	Dec-08	<0.1	<0.1	636	2.5	650
PMW-1D	Jan-08	2	<0.1	240	0.3	420
	Jul-08	3	0.1	NM	0.4	560
	Sep-08	NM	NM	NM	NM	680
	Oct-08	<0.1	0.1	806	5	390
	Dec-08	<0.1	0.3	746	1.6	380
PMW-2D	Jan-08	1	<0.1	212	0.2	340
	Jul-08	3	<0.1	1672	2	520
	Sep-08	NM	NM	NM	NM	780
	Oct-08	1.0	3	766	5	480
	Dec-08	0.6	0.6	936	0.2	160
PMW-3D	Jan-08	<0.1	<0.1	138	0.3	260
	Jul-08	1	<0.1	1508	2.2	460
	Sep-08	NM	NM	NM	NM	600
	Oct-08	NM	3	6000	5	480
	Dec-08	<0.1	<0.1	825	1.25	450
PMW-4D	Jan-08	1	<0.1	200	0.9	300
	Jul-08	1	0.1	900	2	540
	Sep-08	NM	NM	NM	NM	680
	Oct-08	NM	0.8	1298	5	650
	Dec-08	0.4	<0.1	827	2.25	180
PMW-5D	Jan-08	1	<0.1	200	0.1	300
	Jul-08	2	1.8	598	2	460
	Sep-08	NM	NM	NM	NM	720
	Oct-08	NM	2.75	672	5	480
	Dec-08	0.0	1.8	515	0.01	40
PMW-6D	Jan-08	1	<0.1	196	<0.01	280
	Jul-08	4	0.1	1749	2	600
	Sep-08	NM	NM	NM	NM	500
	Oct-08	NM	3	1272	5	576
	Dec-08	<0.1	0.9	1487	2.25	370
PMW-7D	Jan-08	1	<0.1	194	0.3	320
	Jul-08	1	0.2	1200	1.8	620
	Sep-08	NM	NM	NM	NM	760
	Oct-08	NM	2.75	3462	5	680
	Dec-08	<0.1	1.2	3850	<0.01	730
PMW-8D	Jan-08	1	<0.1	265	0.3	320
	Jul-08	2	<0.1	1114	1.5	540
	Sep-08	NM	NM	NM	NM	NM
	Oct-08	NM	2.75	900	5	480
	Dec-08	0.6	2.1	670	0.03	834
RMW-4D	Jan-08	<0.1	<0.1	96	4	320
	Jul-08	1	0.15	900	2.2	580
	Sep-08	NM	NM	NM	NM	440
	Oct-08	NM	0.9	4024	5	615
	Dec-08	<0.1	<0.006	1196	2	200
MW-7D	Jan-08	<0.1	<0.1	140	0.5	360
	Jul-08	<0.1	NM	NM	0.8	NM
	Sep-08	NM	NM	NM	NM	740
	Oct-08	NM	3	3450	5	565
	Dec-08	<0.1	1.8	337	<0.01	180

NM = not measured
[a/] $CaCO_3$ - calcium carbonate, refers to type of alkalinity test.

TABLE 3.4
SUMMARY OF FIELD PARAMETER READINGS

Well ID	Date	Specific Conductivity mS/cm	Oxidataion Reduction Potential mv	pH SU
INJ-01	1/15/08	3.84	-184	7.22
	6/17/08	#N/A	#N/A	#N/A
	6/20/08	5.4	#N/A	#N/A
	6/25/08	4.21	-210	#N/A
	7/1/08	5.02	-186	#N/A
	7/10/08	4.48	-243	#N/A
	7/15/08	4.84	-234	#N/A
	7/23/08	3.6	-300	6.11
	8/7/08	4.57	-339	6.54
	8/27/08	4.21	-380	6.20
	9/10/08	5.21	-380	5.88
	9/25/08	4.54	-384	5.95
	10/1/08	5.41	-373	5.94
	10/20/2008	#N/A	#N/A	#N/A
	11/3/2008	4.28	-364	5.97
	12/12/08	2.52	-356	6.04
INJ-02	1/15/08	4.36	-146	7.01
	6/17/08	#N/A	#N/A	#N/A
	6/20/08	5.03	#N/A	#N/A
	6/25/08	4.08	-266	#N/A
	7/1/08	4.14	-206	#N/A
	7/10/08	3.62	-249	#N/A
	7/15/08	3.07	-198	#N/A
	7/23/08	3.7	-304	6.32
	8/7/08	2.98	-256	6.48
	8/27/08	2.83	-344	6.08
	9/10/08	3.44	-343	5.54
	9/25/08	2.98	-376	5.7
	10/1/08	#N/A	#N/A	#N/A
	10/20/08	#N/A	#N/A	#N/A
	11/3/08	1.06	-273	5.79
	12/12/08	2.276	-329	6.03
INJ-03	1/15/08	#N/A	#N/A	#N/A
	6/17/08	#N/A	#N/A	#N/A
	6/20/08	5.05	#N/A	#N/A
	6/25/08	3.17	-195	#N/A
	7/1/08	3.2	-190	#N/A
	7/10/08	3.25	-262	#N/A
	7/15/08	3.07	-211	#N/A
	7/23/08	#N/A	#N/A	#N/A
	8/7/08	3.49	-300	6.04
	8/27/08	3.2	-304	5.71
	9/10/08	4.9	-395	6.10
	9/25/08	4.41	-386	6.05
	10/1/08	#N/A	#N/A	#N/A
	10/20/08	#N/A	#N/A	5.58
	11/3/08	4.1	-399	5.95
	12/12/08	#N/A	#N/A	#N/A
INJ-04	1/15/08	#N/A	#N/A	#N/A
	6/17/08	#N/A	#N/A	#N/A
	6/20/08	4.12	#N/A	#N/A
	6/25/08	3.37	-191	#N/A
	7/1/08	3.96	-184	#N/A
	7/10/08	3.38	-238	#N/A
	7/15/08	3.05	-232	#N/A
	7/23/08	#N/A	#N/A	#N/A
	8/7/08	2.92	-239	6.28
	8/27/08	3.75	-347	6.07
	9/10/08	4.17	-347	5.30
	9/25/08	4.31	-380	5.88
	10/1/08	#N/A	#N/A	#N/A
	10/20/08	#N/A	#N/A	5.53
	11/3/08	4.07	-351	5.72
	12/12/08	#N/A	#N/A	#N/A

TABLE 3.4
SUMMARY OF FIELD PARAMETER READINGS

Well ID	Date	Specific Conductivity mS/cm	Oxidataion Reduction Potential mv	pH SU
INJ-05	1/15/08	#N/A	#N/A	#N/A
	6/17/08	#N/A	#N/A	#N/A
	6/20/08	5.02	#N/A	#N/A
	6/25/08	4.39	-196	#N/A
	7/1/08	5.07	-145	#N/A
	7/10/08	4.47	-247	#N/A
	7/15/08	4.63	-244	#N/A
	7/23/08	#N/A	#N/A	#N/A
	8/7/08	4.42	-257	5.95
	8/27/08	4.04	-340	5.91
	9/10/08	4.16	-382	5.62
	9/25/08	#N/A	#N/A	#N/A
	10/1/08	#N/A	#N/A	#N/A
	10/20/08	#N/A	#N/A	#N/A
	11/3/2008	#N/A	#N/A	#N/A
	12/12/08	#N/A	#N/A	#N/A
PMW-1D	1/15/08	#N/A	#N/A	6.85
	6/17/08	#N/A	#N/A	#N/A
	6/20/08	#N/A	#N/A	#N/A
	6/25/08	#N/A	#N/A	#N/A
	7/1/08	#N/A	#N/A	#N/A
	7/10/08	#N/A	#N/A	#N/A
	7/15/08	#N/A	#N/A	#N/A
	7/23/08	#N/A	#N/A	6.27
	8/7/08	#N/A	#N/A	7.22
	8/27/08	#N/A	#N/A	5.98
	9/10/08	#N/A	#N/A	6.68
	9/25/08	#N/A	#N/A	#N/A
	10/1/08	5.2	-355	6.8
	10/20/08	#N/A	#N/A	#N/A
	11/3/2008	#N/A	#N/A	#N/A
	12/12/08	3.794	-361	6.91
PMW-2D	1/15/08	4.04	-183	7.47
	6/17/08	2.8	#N/A	#N/A
	6/20/08	5.54	#N/A	#N/A
	6/25/08	5.66	-138	#N/A
	7/1/08	5.28	-133	#N/A
	7/10/08	4.46	-282	#N/A
	7/15/08	5.22	-229	#N/A
	7/23/08	4.07	-294	6.40
	8/7/08	4.25	-261	5.65
	8/27/08	3.94	-306	5.74
	9/10/08	4.93	-364	5.45
	9/25/08	4.46	-347	5.55
	10/1/08	4.57	-347	5.72
	10/20/08	#N/A	#N/A	#N/A
	11/3/08	4.1	-331	5.62
	12/12/08	2.198	-324	5.67
PMW-3D	1/15/08	2.83	-255	7.46
	6/17/08	3.03	#N/A	#N/A
	6/20/08	5.42	#N/A	#N/A
	6/25/08	4.9	-228	#N/A
	7/1/08	4.37	-268	#N/A
	7/10/08	3.67	-283	#N/A
	7/15/08	3.4	-278	#N/A
	7/23/08	3.35	-309	6.46
	8/7/08	3.13	-330	6.12
	8/27/08	2.8	-367	5.97
	9/10/08	3.28	-388	5.84
	9/25/08	2.96	-376	5.91
	10/1/08	3.04	-356	6.32
	10/20/08	#N/A	#N/A	#N/A
	11/3/08	2.32	-351	6.34
	12/12/08	1.607	-353	6.45

TABLE 3.4
SUMMARY OF FIELD PARAMETER READINGS

Well ID	Date	Specific Conductivity mS/cm	Oxidataion Reduction Potential mv	pH SU
PMW-4D	1/15/08	2.86	-305	7.48
	6/17/08	3.1	#N/A	#N/A
	6/20/08	5.09	#N/A	#N/A
	6/25/08	4.36	-260	#N/A
	7/1/08	3.62	-276	#N/A
	7/10/08	3.35	-276	#N/A
	7/15/08	3.23	-268	#N/A
	7/23/08	4	-331	6.40
	8/7/08	2.93	-333	6.76
	8/27/08	2.64	-373	6.58
	9/10/08	3.28	-411	6.29
	9/25/08	3.06	-391	6.62
	10/1/08	5.11	-383	6.32
	10/20/08	#N/A	#N/A	6.96
	11/3/08	3.11	-394	6.48
	12/12/08	1.592	-344	6.61
PMW-5D	1/15/08	2.28	-203	7.24
	6/17/08	#N/A	#N/A	#N/A
	6/20/08	4.81	#N/A	#N/A
	6/25/08	4.26	-229	#N/A
	7/1/08	4.17	-264	#N/A
	7/10/08	3.47	-236	#N/A
	7/15/08	3.42	-285	#N/A
	7/23/08	2.99	-298	6.68
	8/7/08	2.99	-326	6.43
	8/27/08	2.69	-317	6.32
	9/10/08	4.32	-382	5.78
	9/25/08	3.27	-310	5.94
	10/1/08	4.11	-371	5.9
	10/20/08	#N/A	#N/A	6.08
	11/3/08	2.31	-342	6.07
	12/12/08	1.558	-326	6.16
PMW-6D	1/15/08	3.65	-126	7.23
	6/17/08	2.29	#N/A	#N/A
	6/20/08	5.43	#N/A	#N/A
	6/25/08	4.52	-196	#N/A
	7/1/08	5.11	-227	#N/A
	7/10/08	4.38	-257	#N/A
	7/15/08	4.1	-324	#N/A
	7/23/08	4.2	-322	6.24
	8/7/08	3.94	-330	6.31
	8/27/08	3.31	-338	6.20
	9/10/08	4.73	-382	5.73
	9/25/08	1.78	-283	5.7
	10/1/08	4.07	-316	5.82
	10/20/08	#N/A	#N/A	5.77
	11/3/08	0.94	-318	5.94
	12/12/08	1.92	-275	7.04
PMW-7D	1/15/08	3.13	-169	7.27
	6/17/08	#N/A	#N/A	#N/A
	6/20/08	5.27	#N/A	#N/A
	6/25/08	4.35	-166	#N/A
	7/1/08	5.16	-206	#N/A
	7/10/08	4.32	-222	#N/A
	7/15/08	4.5	-293	#N/A
	7/23/08	3.8	-327	6.34
	8/7/08	2.94	-326	6.54
	8/27/08	3.27	-359	6.18
	9/10/08	4.04	-379	5.7
	9/25/08	3.7	-361	5.88
	10/1/08	4.4	-386	5.95
	10/20/08	#N/A	#N/A	#N/A
	11/3/08	2.82	-374	6.22
	12/12/08	2.498	-353	6.34

TABLE 3.4
SUMMARY OF FIELD PARAMETER READINGS

Well ID	Date	Specific Conductivity mS/cm	Oxidataion Reduction Potential mv	pH SU
PMW-8D	1/15/08	4.02	-155	7.73
	6/17/08	#N/A	#N/A	#N/A
	6/20/08	5.89	#N/A	#N/A
	6/25/08	5.48	-225	#N/A
	7/1/08	6.04	-229	#N/A
	7/10/08	4.93	-285	#N/A
	7/15/08	4.96	-266	#N/A
	7/23/08	4.1	-327	6.30
	8/7/08	4.33	-268	6.31
	8/27/08	3.44	-371	6.33
	9/10/08	4.83	-396	6.08
	9/25/08	4.46	-396	6.23
	10/1/08	5.71	-378	6.19
	10/20/08	#N/A	#N/A	6.70
	11/3/08	3.31	-400	6.5
	12/12/08	2.218	-390	6.51
MW-7D	1/15/08	3.15	-275	7.51
	6/17/08	#N/A	#N/A	#N/A
	6/20/08	#N/A	#N/A	#N/A
	6/25/08	#N/A	#N/A	#N/A
	7/1/08	4.46	-209	#N/A
	7/10/08	4.28	-227	#N/A
	7/15/08	4.04	-209	#N/A
	7/23/08	#N/A	-388	5.90
	8/7/08	3.61	-243	5.96
	8/27/08	2.56	-333	6.08
	9/10/08	4.1	-415	5.82
	9/25/08	4.98	-399	6.17
	10/1/08	5.17	-385	6.13
	10/20/08	#N/A	#N/A	#N/A
	11/3/08	2.8	-314	5.95
	12/12/08	1.948	-334	6.04
RMW-4D	1/15/08	2.98	-352	7.51
	6/17/08	#N/A	#N/A	#N/A
	6/20/08	5.43	#N/A	#N/A
	6/25/08	4.31	-266	#N/A
	7/1/08	3.72	-269	#N/A
	7/10/08	3.27	-273	#N/A
	7/15/08	3.26	-263	#N/A
	7/23/08	3.65	-297	6.48
	8/7/08	2.86	-283	5.96
	8/27/08	2.31	-361	6.08
	9/10/08	3.32	-386	5.93
	9/25/08	2.95	-382	6.19
	10/1/08	4.19	-378	6.05
	10/20/08	#N/A	#N/A	#N/A
	11/3/08	2.85	-383	6.34
	12/12/08	2.88	-350	6.48

#NA = Not Applicable, typically due to no sampling being taken.
mS/cm - millisiemens / cm
mV - Millivolts
SU - Standard Units

TABLE 3.5
RESULTS OF MICROBIAL CENSUS SURVEY

			DECHLORINATING BACTERIA		FUNCTIONAL GENES		
Sample ID	Sample Date	Monthes	DHB (cells/ml)	DHC (cells/ml)	BVC R-DASE (cells/ml)	TCE R-DASE (cells/ml)	VCR R-DASE (cells/ml)
INJ-01	1/15/2008	Baseline	2.00E+00	8.33E+02	9.16E+03	3.07E+00	3.72E+03
	7/24/2008	1.2	6.25E+03	8.88E+02	8.75E+02	5.00E+00 U	7.57E+01
	12/15/2008	6.0	1.93E+01	2.14E+04	3.04E+03	1.60E+02	7.68E+02
INJ-02	1/16/2008	Baseline	8.43E+00	1.37E+03	5.83E+03	4.63E+00	6.39E+03
	7/24/2008	1.2	3.70E+03	3.76E+03	2.62E+03	9.97E-01 J	2.73E+02
	12/11/2008	5.9	2.48E+03	1.40E+05	8.85E+03	2.61E+02	6.00E-01 U
PMW-3D	1/15/2008	Baseline	4.24E+00	9.54E+02	1.72E+04	7.21E+00	4.91E+03
	7/22/2008	1.1	6.97E+03	5.78E+02	9.97E+02	3.26E-01 J	1.47E+02
	12/11/2008	5.9	1.69E+03	3.36E+02	1.44E+02	5.00E-01 U	2.50E+00
PMW-5D	1/15/2008	Baseline	1.00E+00 U	5.00E-01 U	5.00E-01 U	5.00E-01 U	5.00E-01 U
	7/22/2008	1.1	2.11E+03	1.89E+03	2.68E+03	1.89E+00	5.36E+02
	12/11/2008	5.9	5.30E+03	2.56E+03	5.00E-01 U	2.22E+02	5.00E-01 U
RMW-4D	1/15/2008	Baseline	1.00E+00 U	5.00E-01 U	5.00E-01 U	5.00E-01 U	5.00E-01 U
	7/24/2008	1.2	4.71E+03	3.41E+02	2.95E+02	1.43E+00 U	4.92E+01
	12/11/2008	5.9	1.14E+03	1.01E+02	2.00E-01 J	1.72E+01	5.00E-01 U

Notes:
DHC - Dehalococcoides spp
DHB - Dehalobacter spp.
BVC R-DASE - reductase gene that is responsible for the breakdown of vinyl chloride in strain BAV1.
TCE R-DASE - reductase gene that is responsible for the breakdown of TCE to cis-DCE.
VCR R-DASE - reductase gene that is responsible for the breakdown of vinyl chloride to ethene in strain VS and GT of Dehalococcoides.
cells/ml - number of microbial cells per milliliter of sample.
U - Result was less than value given in table.
J - Estimated value

TABLE 3.6
LABORATORY RESULTS SUMMARY OF VOLATILE ANALYTES

Well ID	Date	Months from Injection	PCE[a/] µg/l[c/]	TCE[a/] µg/l	cis-1,2-DCE µg/l	trans-DCE µg/l	1,1-DCE µg/l	VC[a/] µg/l	Ethene µg/l	Ethane µg/l	Ethene + Ethane µg/l	Methane µg/l	TCA µg/l	1,1,-DCA µg/l
INJ-01	15-Jan-08	Baseline	840 J	100000	23000	*5000 U*	*5000 U*	1600 J	17	7	24	78	*5000 U*	*5000 U*
	24-Jul-08	1.2	*5000 UJ*	2600 J	150000 J	380 J	*5000 UJ*	1600 J	52 J	9.2 J	61.2	100 J	*5000 UJ*	*5000 UJ*
	29-Sep-08	3.4	*5000 U*	3300 J	110000	920 J	210 J	2900 J	16.0	6.5	22.5	100	*5000 U*	*5000 U*
	15-Dec-08	6.0	100 J	14000	150000 J	1100 J	220 J	3500	12	6.4	18.4	66	*1300 U*	62 J
PMW-1D	15-Jan-08	Baseline	930 J	180000	36000	*5000 U*	*5000 U*	2100	19	5.1	24.1	120	*5000 U*	*5000 U*
	25-Jul-08	1.2	280 J	17000 J	82000 J	200 J	260 J	3900 J	16 J	3.8 J	19.8	68 J	*2500 UJ*	*2500 UJ*
	1-Oct-08	3.5	*5000 U*	38000	110000	1900 J	310 J	2200	23	14	37	230	*5000 U*	*5000 U*
	11-Dec-08	5.9	*2500 U*	14000	130000 J	1500 J	280 J	4800	25	18	43	200	*2500 U*	*2500 U*
PMW-2D	16-Jan-08	Baseline	910 J	110000	27000	*5000 U*	*5000 U*	1600 J	19	6.9	26	87	*5000 U*	*5000 U*
	23-Jul-08	1.2	*5000 U*	1100 J	150000	580 J	380 J	1800 J	34	7.6	41.6	110	*5000 U*	*5000 U*
	29-Sep-08	3.4	*5000 U*	3200 J	120000	680 J	210 J	2600	16	5.8	21.8	89	*5000 U*	*5000 U*
	11-Dec-08	5.9	*1000 U*	2300	76000	260 J	88 J	1600	9.3	6.6	15.9	39	*1000 U*	40 J
PMW-3D	15-Jan-08	Baseline	1400 J	240000	31000	*5000 U*	*5000 U*	640 J	20	9.6	30	82	*5000 U*	*5000 U*
	22-Jul-08	1.1	*2500 U*	540 J	83000	210 J	*2500 U*	760 J	24	16	40	120	*2500 U*	*2500 U*
	29-Sep-08	3.4	13 J	1000	9000	50 J	15 J	99 J	4.7	35	39.7	160	16 J	*250 U*
	11-Dec-08	5.9	*250 U*	550	5600	26 J	*250 U*	130 J	8.7	6.4	15.1	36	*250 U*	*250 U*
PMW-4D	16-Jan-08	Baseline	1100 J	220000	36000	*5000 U*	*5000 U*	690 J	17	10	27	94	*5000 U*	*5000 U*
	22-Jul-08	1.1	*5000 U*	3500 J	160000	510 J	350 J	1100 J	38	12	50	110	*5000 U*	*5000 U*
	30-Sep-08	3.5	*1300 U*	5900	91000	990 J	140 J	1400	10	9.1	19	77	*1300 U*	*1300 U*
	11-Dec-08	5.9	*1000 U*	1000	22000	140 J	*1000 U*	680 J	14	17	31	120	*1000 U*	*1000 U*
PMW-5D	15-Jan-08	Baseline	1700 J	91000	11000	*2500 U*	*2500 U*	420 J	19	5.9	24.9	60	750 J	*2500 U*
	22-Jul-08	1.1	*5000 U*	950 J	100000	430 J	*5000 U*	1800 J	72	10	82	120	*5000 U*	*5000 U*
	29-Sep-08	3.4	*2500 U*	4800	92000	500 J	200 J	2400	18	8.8	26.8	85	*2500 U*	*2500 U*
	11-Dec-08	5.9	*2500 U*	6900	71000	540 J	110 J	1300 J	21	15	36	100	*2500 U*	10 J

ITALICIZED VALUES REPRESENT DETECTION LIMIT WHEN THE PARAMETER WAS NOT DETECTED

INJECTION OF SUBSTRATE WAS COMPLETED ON 18-JUNE-08

J = ESTIMATED VALUE

U = BELOW DETECTION LIMITS

UJ = ESTIMATED NON-DETECT POSSIBLY BIASED LOW

TABLE 3.6
LABORATORY RESULTS SUMMARY OF VOLATILE ANALYTES

Well ID	Date	Months from Injection	PCE[a/] µg/l[c/]	TCE[a/] µg/l	cis-1,2-DCE µg/l	trans-DCE µg/l	1,1-DCE µg/l	VC[a/] µg/l	Ethene µg/l	Ethane µg/l	Ethene + Ethane µg/l	Methane µg/l	TCA µg/l	1,1,-DCA µg/l
PMW-6D	14-Jan-08	Baseline	1000 J	100000	17000	*5000 U*	*5000 U*	820 J	16	6.5	23	62	500 J	*5000 U*
	22-Jul-08	1.1	*5000 U*	2200 J	140000	380 J	*5000 U*	1200 J	37	11	48	100	*5000 U*	*5000 U*
	29-Sep-08	3.4	*2500 U*	2800	92000	540 J	160 J	1900 J	14	12	26	71	*2500 U*	*2500 U*
	11-Dec-08	5.9	*500 U*	310 J	17000	230 J	29 J	170 J	12	3.6	16	56	41 J	*500 U*
PMW-7D	16-Jan-08	Baseline	950 J	160000	27000	*5000 U*	*5000 U*	860 J	18	7.2	25	80	*5000 U*	*5000 U*
	24-Jul-08	1.2	*5000 UJ*	*5000 UJ*	120000 J	*5000 UJ*	*5000 UJ*	940 J	37 J	7.4 J	44	76 J	*5000 UJ*	*5000 UJ*
	30-Sep-08	3.5	*5000 U*	2300 J	100000	840 J	280 J	1700 J	13	7.5	21	59	*5000 U*	*5000 U*
	11-Dec-08	5.9	*1000 U*	2400	84000	400 J	110 J	2600	6.3	7.8	14	230 J	*1000 U*	66 J
PMW-8D	14-Jan-08	Baseline	1200 J	240000	28000	*5000 U*	*5000 U*	1100 J	17	5.1	22	78	*5000 U*	*5000 U*
	23-Jul-08	1.2	*1000 U*	2900 J	110000	310 J	240 J	1500 J	29	7.2	36	100	*1000 U*	*1000 U*
	29-Sep-08	3.4	240 J	34000	76000	420 J	200 J	2100	16	5.9	22	92	*2500 U*	*2500 U*
	11-Dec-08	5.9	600 J	66000 D	48000	310 J	95 J	2300	2.0	6.2	8.2	5	*1300 U*	*1300 U*
MW-7D	15-Jan-08	Baseline	720 J	140000	26000	*5000 U*	*5000 U*	690 J	15	12	27	82	360 J	*5000 U*
	25-Jul-08	1.2	*5000 UJ*	*5000 UJ*	130000 J	360 J	*5000 UJ*	900 J	28 J	16 J	44	72 J	*5000 UJ*	*5000 UJ*
	30-Sep-08	3.5	*2500 U*	1200 J	59000	740 J	140 J	1500	13	4.4	17	55	*2500 U*	*2500 U*
	11-Dec-08	5.9	*2500 U*	2600	53000	250 J	*2500 U*	1400 J	15	5.3	20.3	62	*2500 U*	*2500 U*
RMW-4D	15-Jan-08	Baseline	570 J	130000	18000	*5000 U*	*5000 U*	430 J	14	19	33	110	*5000 U*	*5000 U*
	24-Jul-08	1.2	*5000 UJ*	450 J	100000 J	*5000 UJ*	*5000 UJ*	1100 J	46 J	15 J	61	110 J	*5000 UJ*	*5000 UJ*
	30-Sep-08	3.5	*1300 UJ*	3700 J	38000 J	370 J	75 J	680 J	7.1	23	30	130	*1300 UJ*	*1300 UJ*
	11-Dec-08	5.9	*250 U*	660	5400	28 J	*250 U*	79 J	2.1	28	30	130	*250 U*	*250 U*

ITALICIZED VALUES REPRESENT DETECTION LIMIT WHEN THE PARAMETER WAS NOT DETECTED

INJECTION OF SUBSTRATE WAS COMPLETED ON 18-JUNE-08

J = ESTIMATED VALUE

U = BELOW DETECTION LIMITS

UJ = ESTIMATED NON-DETECT POSSIBLY BIASED LOW

Appendix A

- Well Information
- Boring Logs
- Caliper Log Summary
- Borehole Video Snap Shots
- Well Development Records

MAY, 2009 WATER LEVEL MEASUREMENTS

Table
Ekonol Facility
Groundwater Summary Table
Wheatfield, New York
May, 2008

Monitoring Well ID	Northing	Easting	Top of Well Casing Elevation (Feet)	Depth to Water 5/22/2008 (Feet TOC)	Water Level Elevation 5/22/2008 (Feet)
Shallow					
MW-1S	1132468.53	1056192.71	585.06	4.71	580.35
MW-2S	1132311.92	1056254.14	585.11	3.28	581.83
MW-3S	1132228.17	1056317.60	584.83	4.45	580.38
MW-4S	1132220.46	1056183.51	585.79	8.07	577.72
MW-5S	1132454.91	1056429.00	585.66	7.82*	NA
MW-6S	1132123.45	1056266.92	585.64	7.88	577.76
MW-7S	1132148.61	1056161.35	586.46	5.91	580.55
MW-8S	1132192.87	1056062.61	586.19	5.78	580.41
MW-9S	1132273.82	1056094.38	586.10	7.92	578.18
MW-10S	1132303.24	1056442.61	585.77	7.65	578.12
MW-11S	1132005.83	1056372.98	586.00	7.85	578.15
MW-12S	1132057.93	1056235.49	586.11	7.98	578.13
Deep					
MW-7D (b)	1132156.49	1056173.63	586.16	8.15	578.01
MW-10D	1132241.44	1055990.20	585.47	7.78	577.69
MW-11D	1132119.94	1056434.68	588.42	11.13	577.29
MW-12D	1132286.53	1055849.97	585.85	8.14	577.71
MW-13D	1131373.46	1056401.65	587.89	11.92	575.97
MW-14D	1132399.34	1056477.88	587.70	9.87	577.83
MW-15D	1131333.59	1055873.33	585.76	9.15	576.61
MW-16D	1131176.05	1056393.84	586.96	12.67	574.29
MW-17D	1131980.99	1056444.40	587.31	9.94	577.37
MW-18D	1132083.84	1056621.36	587.07	9.36	577.71
MW-19D	1131339.31	1055674.08	585.44	7.70	577.74
MW-20D	1131530.44	1056045.44	586.17	NR	NA
MW-21D	1131532.09	1055862.75	585.90	8.19	577.71
RMW-1D	1132461.00	1056171.00	585.93	7.74	578.19
RMW-2D	1132291.00	1056235.00	586.14	8.66	577.48
RMW-3D	1132214.00	1056302.00	586.01	8.12**	NA
RMW-4D (b)	1132203.28	1056171.69	585.76	8.22	577.54
INJ-01	1132217.92	1056172.53	585.70	8.01	577.69
INJ-02	1132230.81	1056179.53	585.54	7.85	577.69
INJ-03	1132230.97	1056164.47	585.35	7.64	577.71
INJ-04	1132211.60	1056185.83	585.58	7.89	577.69
INJ-05	1132212.19	1056159.24	585.60	7.93	577.67
PMW-1D	1132291.16	1056173.74	585.66	7.58	578.08
PMW-2D	1132220.74	1056180.62	585.85	8.15	577.70
PMW-3D	1132210.57	1056172.04	585.98	8.30	577.68
PMW-4D	1132199.23	1056156.77	585.73	8.05	577.68
PMW-5D	1132209.88	1056200.45	585.73	8.02	577.71
PMW-6D	1132197.91	1056187.65	585.86	8.16	577.70
PMW-7D	1132181.82	1056171.23	585.82	8.14	577.68
PMW-8D	1132222.87	1056158.56	585.46	7.79	577.67

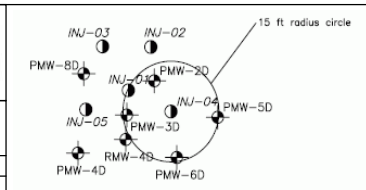
Notes:
* 5/22/08 survey information is not current do to well changes.
** Water elevation not calculated due to anomally, from "flooded" well head and / or outdate survey
NR - Water level data not recorded.
NA - No Applicable
The RMW series wells are the replacement wells for MW-1, MW-2, MW-3 and MW-4.
(b) indicates new coordinates
Survey:
Horizontal Datum = Nad 1983/96
Projection = New York West Zone
Vertical Datum = NGVD 1929

Pilot Test Boring Logs

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/19/2007 15:30
Date Completed	: 12/13/07 11:30
Drilling Method	: Auger, Core
Sampling Method	: Split Spoon, Air Ham., HQ Core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

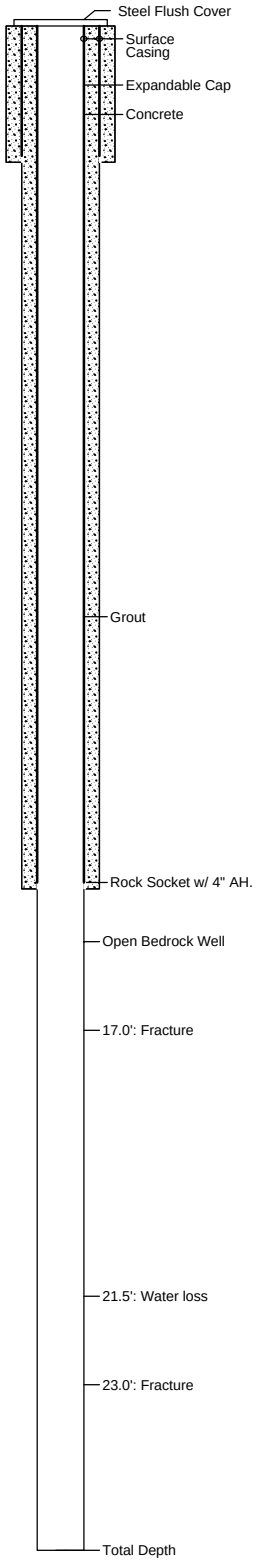
BORING/WELL INJ-01

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test area NE of
	: Saint Gobain Building

Water Levels
▼ After Completion: ~6.0' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0–1		SANDY CLAY, 0.0' - 5.0'. Hand dug. Moist, hard, red, brown, gray, Clay and Silt, trace Gravel (fine-coarse).			0.0	NA	HAND
2–5					0.0	NA	NA
6–7			CL		0.0	NA	NA
8–9					0.0	NA	NA
10					0.0	NA	NA
11–12					0.0	0%	50/0.1'
13–14		12.5' - 14.5'. 2' Rock Socket. Top of Rock at 12.5'. No recovery at 12.5'.	Dolo		0.0	100%	NA
15–16		14.5' - 18.0'. Dolomite, light-medium gray, frequent styolites, minor pitting, filled vugs. Horizontal fracture at 17.0', may be mechanical.	Dolo		0.0	100%	95%
17–18		18.0' - 22.0'. Solid Dolomite, similar to above, less vugs, less pits. Fracture at 21.5'. Lost water with no return.	Dolo		0.0	100%	95%
19–22		22.0' - 25.8'. Similar to above. Lithology change at 22.5' to a lighter color. Major fracture at 23.0'.	Dolo		0.0	100%	95%
23–26							

Well: INJ-01
TOC Height:



Monitoring Well Construction Information

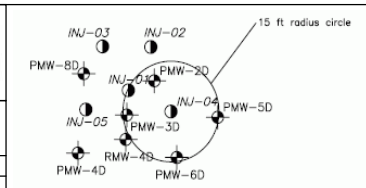
CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 4"
Joints	: None
WELL SCREEN	: No screen, open borehole
SAND PACK	: none
SEAL	
GROUT	: Soil casing
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 12.5 ft.

Notes:
AH - Air Hammer
NA - Not Applicable due to technique

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/28/2007 14:00
Date Completed	: 12/11/07 11:30
Drilling Method	: Auger, AH, HQ core
Sampling Method	: Split Spoon, HQ core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

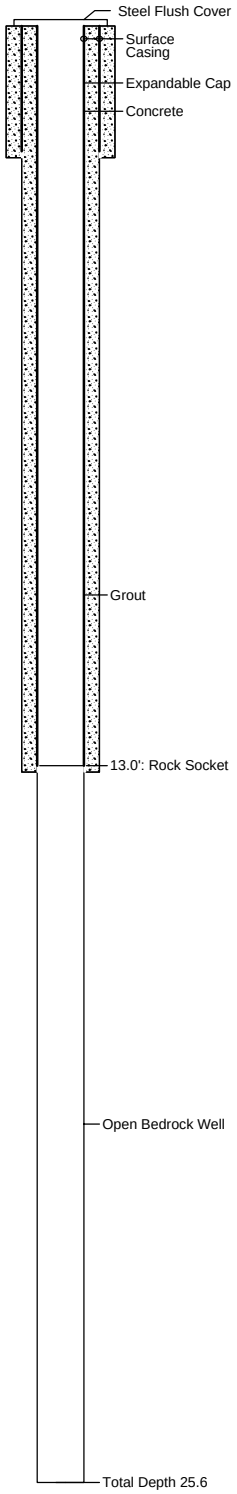
BORING/WELL INJ-02

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test area NE of
	: Saint Gobain

Water Levels
▼ After Completion: ~ 6.0' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Rec %	Blow Count / RQD%
0–5		0.0' - 5.0'. Hand dug. Similar to nearby wells. Moist, hard, red, brown, gray, CLAY and SILT, trace GRAVEL (f-c).	CL		0.0		HAND
5–10			CL		0.0	NA	NA
10–12			CL		0.0	NA	NA
12			CL		0.0	0%	50/0.1'
13–15		13.0' - 15.0'. 2' Rock Socket. Top of Rock at 13.0'. Soft Rock ~ 1.0' - 1.5' into rock.	Dolo		0.0		NA
15–18		See INJ-01	Dolo		0.0		NA
18–22			Dolo		0.0		NA
22–27			Dolo		0.0		NA

Well: INJ-02
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION

Boring Diameter	: ~8" O.D. upper, ~4" lower

WELL RISER

Material	: Stainless Steel
Diameter	: 4"
Joints	: Threaded
WELL	: Open Rock Hole
Interval (bgs)	: 13.0-25.6'

GROUT	: Soils casing
Material	: Cement-Bentonite

WELL HEAD

Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"

STEEL CASING

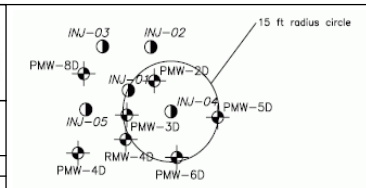
Diameter	: 4-inch
Placment	: Near surface to 12.5 ft.

AH - Air Hammer

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/27/2007
Date Completed	: 11/28/2007
Drilling Method	: Auger, Air Core
Sampling Method	: HQ Core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

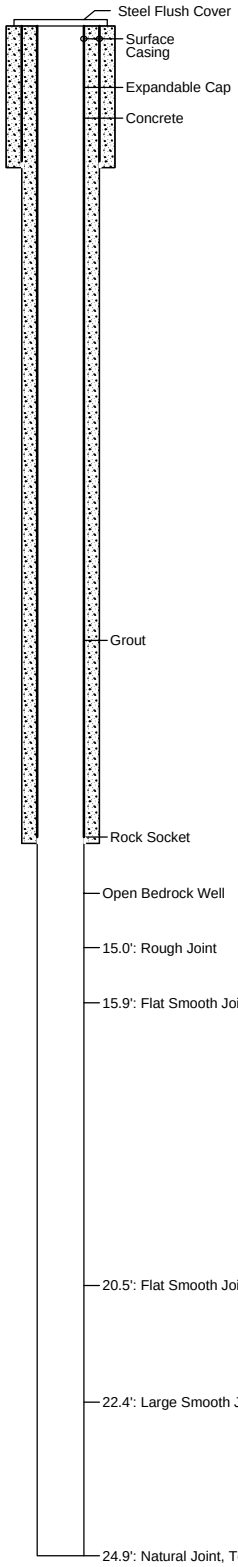
BORING/WELL INJ-03

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test area NE of : Saint Gobain

Water Levels
▼ After Completion: ~6.0' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
0		0.0' - 5.0'. Hand dug.					
		Similar to PMW-8D					
1		Moist, hard, red, brown, gray, CLAY and SILT, trace GRAVEL (f-c).					
		Top of Rock at 12.5'.					
2					0.0	NA	HAND
3							
4							
5							
6			CL		0.0	NA	NA
7							
8					0.0	NA	NA N
9							
10					0.0	NA	NA
11					0.0	0.0%	50/0.1'
		11.0' - 13.2'. Rock Socket.					
12		No recovery at 11.0'.	Dolo				
13							
		13.2' - 17.6'. Similar to other borings. ToR ~1.0' higher in the formation /\.					
14		Natural 30 degree rough joint at 12.5'.					
		Flat smooth joint at 15.9'.					
15					0.0	100%	95%
16			Dolo				
17							
18		17.6' - 22.4'. Similar to above.					
		Horizontal, flat smooth joint at 20.5'.					
19		Large smooth joint marker bed at 22.4'. Water loss, no return					
					0.0	100%	95%
20			Dolo				
21							
22							
		22.4' - 24.9'. Similar to above.					
23		Natural joint at 24.9					
			Dolo				
24					0.0	100%	95%
25							

Well: INJ-03
TOC Height:



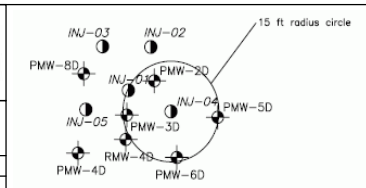
Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Flush mount
Diameter	:
Joints	:
WELL SCREEN	
Material	: No screen open rock hole
Diameter	:
Joints	:
Opening	:
Length	:
SAND PACK	
Material	:
SEAL	
Material	:
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 12.5 ft.

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/27/2007
Date Completed	: 11/27/2007
Drilling Method	: Auger, Hammer, Core
Sampling Method	: HC Core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL INJ-04

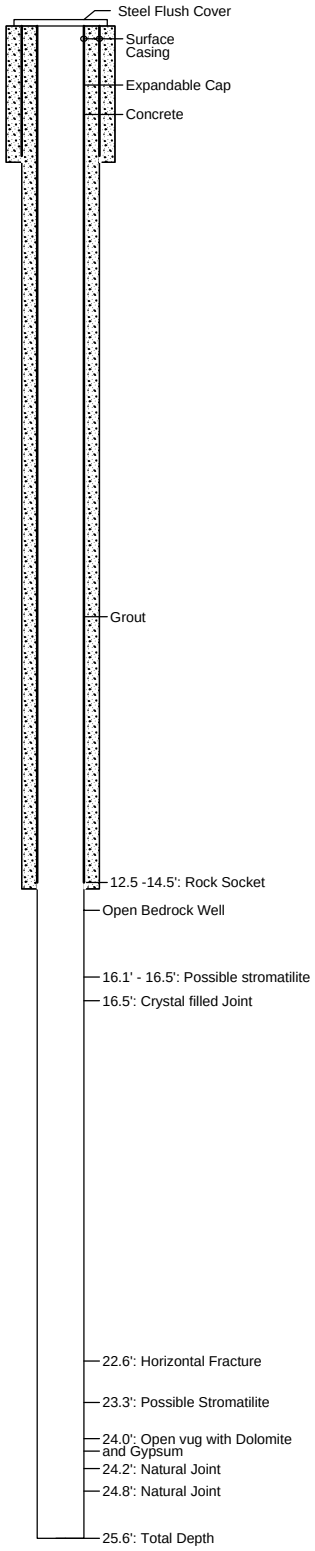
(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test area NE of
	: Saint Gobain

Water Levels
▼ After Completion: ~6.0' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0–5		0.0' - 5.0'. Hand dug. Similar to INJ-01 Moist, hard, red, brown, gray, CLAY and SILT, trace GRAVEL (f-c). Augered to Top of Rock. Top of Rock at 12.5'.	CL		0.0 0.0 0.0	NA	HAND
12.5–14.5		12.5' TOR 12.5' - 14.5'. Rock Socket.	Dolo				
14.5–20.3		14.5' - 20.3'. Massive, hard, dolomite, light gray, minor coral pitting. Few stylolites. Possibly stromatolite from 16.1' to 16.5'. Crystal filled joints at 16.5'. No breaks, full intact rock core.	Dolo		95	88%	NA
20.3–24.8		20.3' - 24.8'. Massive Dolomite similar to above. Horizontal fracture at 22.6', mostly smooth. Marker bed change at 23.3', possible stromatilite. Open vug with dolomite and gypsom at 24.0'. Drill break with Galena at 24.2'. Tight natural joints at 24.2' and 24.8'.	Dolo		0.0	88%	95%
24.8–25.6		24.8' - 25.6'. Dolomite similar to above, lower 5" has coral fossils and pits.	Dolo		0.0	100%	100%

Well: INJ-04
TOC Height:



Monitoring Well Construction Information

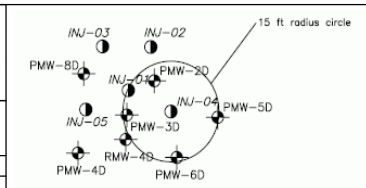
CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 4"
Joints	: Threaded
WELL SCREEN	:
Material	: No Screen, open rock
Diameter	:
Joints	:
Opening	:
Length	:
SAND PACK	
Material	:
SEAL	
Material	:
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 12.5 ft.

PARSONS

Hyde Park Pilot Test
Niagara Falls, New York

Atlantic Richfield (Former Carborundum Plant)

July 2008



Date Started	: 11/20/2007 10:07
Date Completed	: 12/06/07 11:45
Drilling Method	: Auger, AH, HQ Core
Sampling Method	: SS, HQ Core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

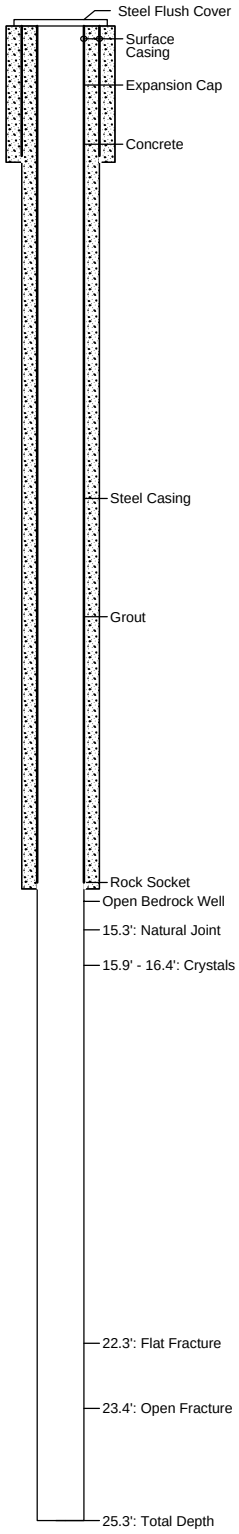
BORING/WELL INJ-05

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test area NE of
	: Saint Gobain

Water Levels
▼ After Completion: ~6.0' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
0–5		0.0' - 5.0'. Hand dug. Moist, hard, red, brown, gray, CLAY and Silt, trace Gravel (fine-coarse).			0.0	NA	HAND
5–10			CL		0.0 0.0 0.0	NA NA NA	NA NA NA
10–12					0.0	0.0%	50/0.1'
12–13		12.5' - 14.5'. 2' Rock Socket. Top of Rock at 12.5'. No recovery at 12.5'.	Dolo				
13–19		Run 1: 14.5' - 19.7'. Dolomite, hard massive, very fine grained. Natural tight joint at 15.3'. Crystaline section from ~15.9' - 16.4'. Only one natural fracture.	Dolo		0.0	90%	100%
19–24		Run 2: 19.7' - 24.75'. Dolomite, massive. Flat, <5 degree fracture at 22.3. Large open fracture at 23.4. Undulating moderately tight fracture at 23.7. Tight fracture at 24.6.	Dolo		0.0	96%	89%
24–25		Run 3: 24.75' - 25.3'. Increase in coral pitting and remnant fossils in bottom of section.	Dolo		0.0	99%	100

Well: INJ-05
TOC Height:



Monitoring Well Construction Information

CONSTRUCTION
Boring Diameter : ~8" O.D. upper, ~4" lower

WELL SCREEN
Material : No Screen
: Open Rock Well

GROUT
Material : Cement-Bentonite

WELL HEAD
Protection : Bolt Down Flush Cover
Well Cap : Expandable Plug
Well Pad : 2'x2'x8"

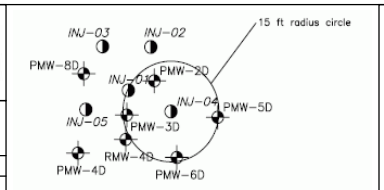
STEEL CASING
Diameter : 4-inch
Placment : Near surface to 15 ft.

Notes:
AH - Air Hammer
SS - Split Spoon Sample

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/17/2007 16:00
Date Completed	: 12/07/07 10:00
Drilling Method	: Auger, AH, HQ core
Sampling Method	: SS, HQ Core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

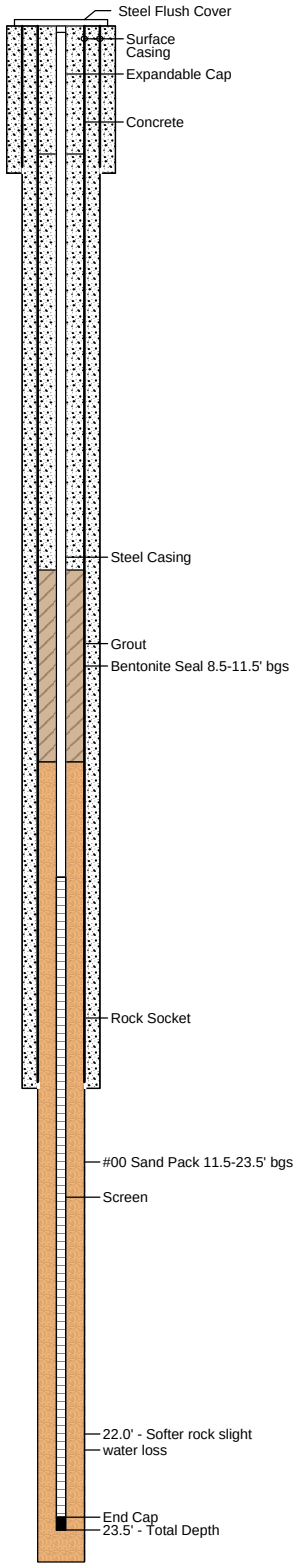
BORING/WELL PMW-1D

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of
	: Saint Gobain

Water Levels
After Completion: ~6' BTOC

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
0–5		SANDY CLAY, 0.0' - 5.0'. Hand dug. Similar to PMW-6D. Moist, stiff, red brown, Clay, and Silt, trace Sand (fine).	CL		0.0	NA	HAND
5–14		5.0' - 13.0'. Similar to PMW-6D. Wet, red, brown, CLAY and SILT, trace SAND (fine). Sheen on soils, not PID hits. Top of Rock 14.5'.	CL		0.0 0.0 0.0 0.0 0.0	NA NA NA NA NA	NA NA NA NA NA
14–16		14.5' - 16.5'. Rock Socket. Top of Rock at 14.5'.	Dolo		0.0	NA	NA
16–24		Well drilled with a 6" Tricon Bit. Not cored Started losing water at 22'. Softer rock, but still had water return. Driller changed to clean water, SILT at bottom of hole needs to be washed out. 22.0' - 25.0', lost some water, but did not completely lose return. End 6" roller bit at 25.0' below ground surface. Pumped 70 gallons of water prior to building well, but could not remove all cuttings from the well. ~1.5' of SAND (coarse) in bottom of boring could not be removed, placed well on top of SAND (coarse). Sheen in development water, strong chemical odor. Well Head PID >200ppm, but dissipates quicky.	Dolo		0.0	NA	NA

Well: PMW-3D
TOC Height:



Monitoring Well Construction Information

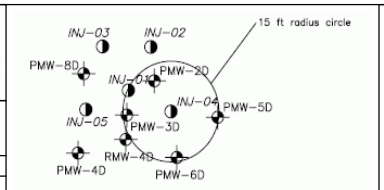
CONSTRUCTION	
Boring Diameter	: ~10" O.D. upper, ~6" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 4"
Joints	: Threaded
WELL SCREEN	
Material	: Stainless Steel
Diameter	: 4-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 6-inch
Placment	: Near surface to 15 ft.

Notes:
AH Air Hammer
HQ Core

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/19/2007
Date Completed	: 12/4/07
Drilling Method	: Auger, AH, HQ-core
Sampling Method	: SS, Core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

BORING/WELL PMW-2D

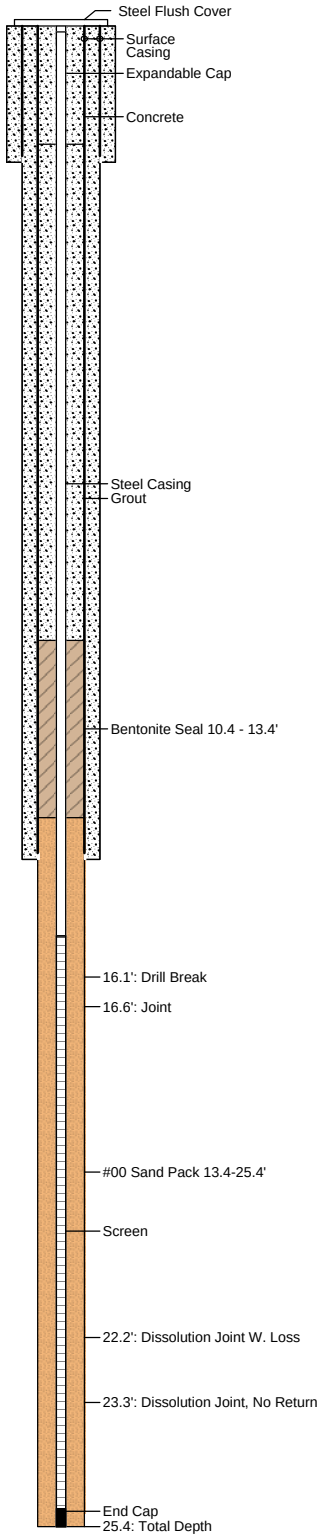
(Page 1 of 1)

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of
	: Saint Gobain

Water Levels
After Completion: ~6' BTOC

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count \ RQD%
0		0.0' - 5.0'. Hand dug.					
		Similar to PMW-6D.					
1		Moist, stiff, red, brown, gray, CLAY and SILT.					
		Top of Rock at 12.5'.					
2					0.0	NA	HAND
3							
4							
5							
6			CL		0.0	NA	NA
7							
8					0.0	NA	NA
9							
10					0.0	NA	NA
11							
12							
13		TOR - 12.5' bgs 12.5' - 14.5'. Rock Socket.	Dolo				
14							
15		Run 1: 14.5' - 19.7'. Dolomite, hard, gray, fine grained. Coral pitted texture, very small (<1 mm). Tight, partial drill break at 16.1'. Joint at 16.6 with calcite and gypsum.					
16							
17			Dolo		0.0	98%	100
18							
19							
20		Run 2: 19.7' - 24.8'. Massive with two joints. Large dissolution at 22.2 and 23.3. Water loss at 22.2'. No return at 23.3'. The fractures are bounded in the marker bed (stromatolite) with thin, black, deformed-like seams.					
21							
22			Dolo		0.0	94%	100
23							
24							
25		Run 3: 24.8' - 25.4'. Dolomite similar to 14.5' - 19.7'. Slightly darker, gray, brown, more pits.	Dolo		0.0	30%	NA
26							

Well: PMW-2D



Monitoring Well Construction Information

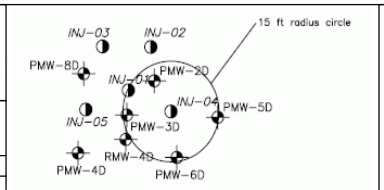
CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 2"
Joints	: Threaded
WELL SCREEN	
Material	: Stainless Steel
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 14 ft.

Notes:
AH - Air Hammer
SS - 2" Split Spoon
W.Loss - Drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/17/2007
Date Completed	: 12/11/07
Drilling Method	: Auger, AH, Air Hammer
Sampling Method	: SS, HQ core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

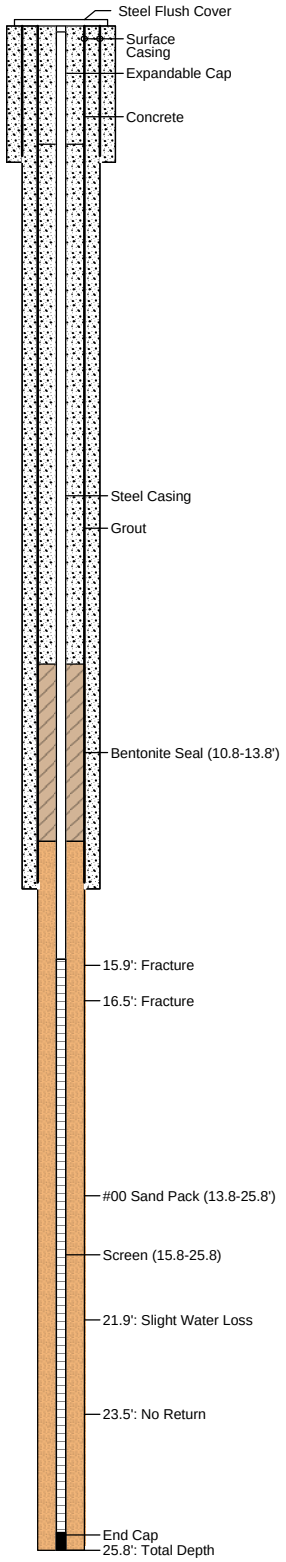
BORING/WELL PMW-3D

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of
	: Saint Gobain

Water Levels
▼ After Completion: ~6' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
0–5		0.0' - 5.0'. Hand dug.	CL		0.0	NA	HAND
5–13		5.0' - 13.0'. Similar to PMW-6D. Moist, hard, red, brown, gray, CLAY and SILT, trace SAND (c-f). Top of Rock 13.0'.	CL		0.0	NA	NA
13–14.5		13.0' - 14.5'. Rock Socket. Top of Rock at 13.0'.	Dolo		0.0	0.0%	50/0.1'
14.5–19		Run 1: 14.5' - 19.0'. Dolomite, hard, gray, fine grained, saccharoidial. Minor coral pits. Tight, rough fracture at 15.9' and 16.5'.	Dolo		0.0	82%	95%
19–24		GRAVEL, Poorly Graded, Run 2: 19.0' - 24.0': 19.0' to 21.9' - Massive, dolomite, gray, hard, fine grained. Contiuous core, no breaks. 21.9' to 24.0' - Same as above but with black, undulateing bedding planes (stromatolite). Fractures every 4" - 6".	Dolo		0.0	95	78%
24–25.8		Run 3: 24.0' - 25.8'. Dolomite, gray, brown, hard, fine grained. Pitted and vugged with coral remnant texture. One, 6cm, coral fossil at bottom.	Dolo		0.0	72%	100%

Well: PMW-3D
TOC Height:



Monitoring Well Construction Information

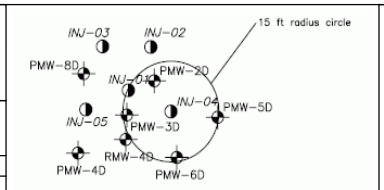
CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 2"
Joints	: Threaded
WELL SCREEN	
Material	: Stainless Steel
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

Notes:
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/21/2007
Date Completed	: 11/26/2007 16:00
Drilling Method	: Auger, AH, HQ core
Sampling Method	: SS, HQ core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

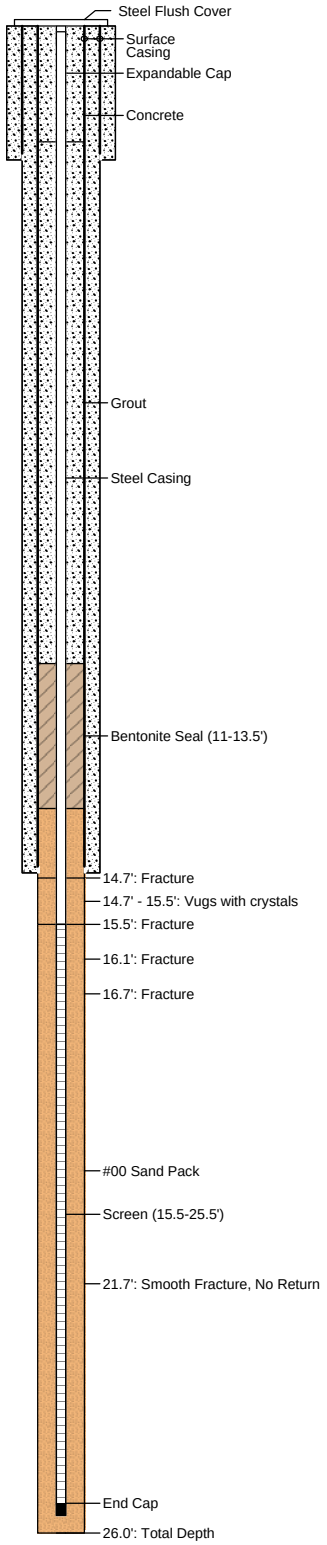
BORING/WELL PMW-4D

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of
	: Saint Gobain

Water Levels
▼ After Completion: ~6' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
0–12		0.0' - 5.0'. Hand dug. Similar to PMW-3D. Moist, stiff, red, brown, gray mottle, CLAY and SILT, trace SAND (c-f). Top of Rock at 12.5'.	CL		0.0	NA	HAND
					0.0	NA	NA
13–14		12.5' TOR 12.5' - 14.5'. Rock Socket.	Dolo		0.0	NA	NA
15–19		Run 1: 14.5' - 19.7'. Dolomite, hare, fine grained, gray, correlates with other cores. Rough, tight fractures at 14.7', 15.5', 16.1' and 16.7'. Vugs with crystals between 14.7. and 15.5'.	Dolo		0.0	90%	81
20–23		Run 2: 19.7' - 24.9': Massive dolomite, same as above. Smooth fracture at 21.7', water loss with no return. Change to marker bed at 22.5', with irregular undulating black seams to 24.9'.	Dolo		0.0	90%	84
24–26		Run 3: 24.9' - 26.5'. Dolomite same as above with coral pits and vugs in the lower foot of the core.	Dolo		0.0	90%	84

Well: PMW-4D



Monitoring Well Construction Information

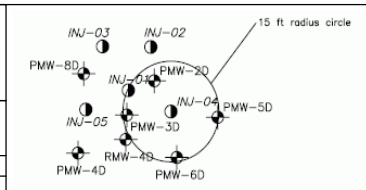
CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 2"
Joints	: Threaded
WELL SCREEN	
Material	: Stainless Steel
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 16 ft.

Notes:
CME-75
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/27/2008
Date Completed	: 12/3/2008
Drilling Method	: HQ, Core, Auger, Air, Rotary
Sampling Method	: Split Spoon
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

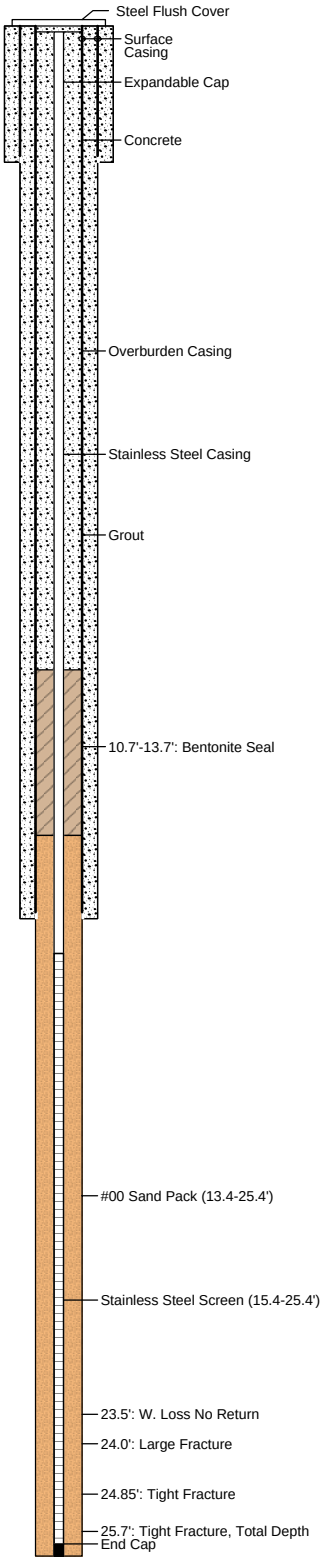
BORING/WELL PMW-5D

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of
	: Saint Gobain

Water Levels
▼ After Completion: ~6' BTOC
▽

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count / RQD%
0–5		0' - 5.0'. Hand dug. Moist, stiff, red, brown, gray mottle, CLAY and Silt, trace Sand (coarse)	CL		0.0	NA	HAND
5–13			CL		0.0	NA	NA
13–15		13.0' - 15'. Rock Socket. Top of Rock at 13.0'.	Dolo				
15–17		Run 1: 15' - 19.7'. Dolomite, hard, gray, fine grained, saccaroidial. Minor pits. Full, intact, core run.	Dolo		0.0	85%	100
17–22		Run 2: 19.7' - 24.85'. Massive. Dolomite same as above. Thin, undulating seams at 23.4' - 24.55'. Large Fracture at 24.0'. Tight Fracture at 24.85'. Gradual water loss until 23.5', then no return.	Dolo		0.0	100%	84%
22–25		Run 3: 24.85' - 25.7'. Dolomite same as above. Gray, brown, with pits and small vugs. Tight fracture at 25.7'.	Dolo		0.0	100%	78%

Well: PMW-5D
TOC Height:



Monitoring Well Construction Information

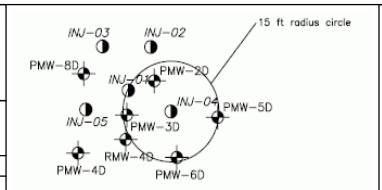
CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: SS
Diameter	: 2"
Joints	: Threaded
WELL SCREEN	
Material	: SS
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

Notes:
CME-75
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/27/2008
Date Completed	: 12/4/07
Drilling Method	: HQ, Core
Sampling Method	: Split Spoon
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

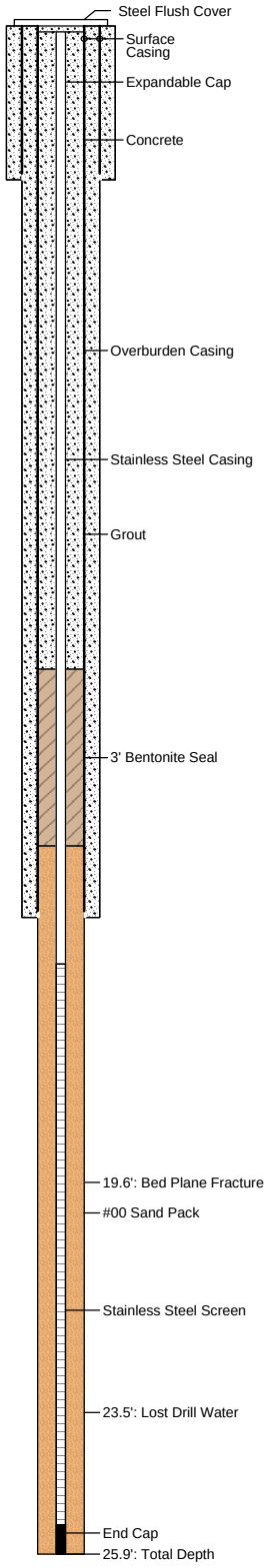
BORING/WELL PMW-6D

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of
	: Saint Gobain

Water Levels
After Completion: ~6' BTOC

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count	RQD %
0–1		SAND, Well Graded, 0' - 5.0'. Hand dug. Moist, stiff, red, brown, gray mottle, CLAY and Silt, trace Sand (coarse)	CL		0.0	NA	HAND	
5–6		5.0' - 7.0'. Moist, very stiff, red-brown, and gray. CLAY and Silt. Laminated. Gypsum crystals embedded in CLAY.	CL		0.0	60%	5 8 9 10	
7–8		SAND, Poorly Graded, 7' - 9'. Moist, stiff, red-brown, gray and tan, Clay and Silt, laminated alternating colors.	CL		0.0	100%	4 3 6 7	
9–10		9' - 11'. Same as above.	CL		0.0	100%	15 10 7 9	
11–12		11' - 13'. Wet, stiff, red-brown, SILT, little CLAY, little Sand (fine-coarse), trace Gravel (fine-coarse). Gravel piece in tip. Refusal at 12.5'.	ML		0.0	100%	5 7 9	
13–14		TOR 12.5' 12.5' - 15'. Rock Socket.	Dolo		0.0	100%	50 NA	
15–16–17–18–19		Run 1: 15' - 19.7'. Massive, gray, hard, dolomite, stylotic horizons, fine grained, small pits.	Dolo		0.0	96%	92%	
20–21–22		Run 2: 19.7' - 24.6'. Dolomite same as above, pitting at bottom, one large natural fracture. Massive dolomite, one large water bearing fracture at 23.7', in irregular bedded marker, may be stromatilite. Gypsum filled vug at 20.0'.	Dolo		0.0	99%	100	
23–24–25		Run 3: 24.6' - 25.9'. Fine grain dolomite, similar to above marker bed. Bottom 3" has coral pitting.	Dolo		0.0	99%	100	
26								

Well: PMW-6D
TOC Height:



Monitoring Well Construction Information

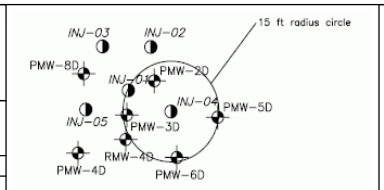
CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: SS
Diameter	: 2"
Joints	: Threaded
WELL SCREEN	
Material	: SS
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

Notes:
CME-75
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/19/2007
Date Completed	: 11/30/2007
Drilling Method	: Auger, AH, HQ core
Sampling Method	: SS, HQ core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

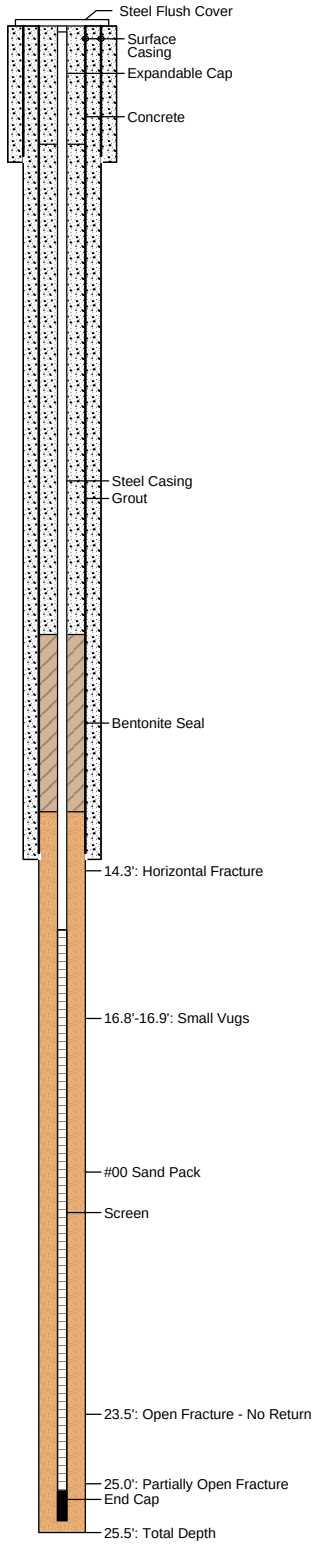
BORING/WELL PMW-7D

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of
	: Saint Gobain

Water Levels
After Completion: ~6' BTOC

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0-5		0.0' - 5.0'. Hand dug. Moist, stiff, red, brown, gray mottled, Clay and Silt, trace Sand (coarse).			0.0	NA	HAND
6			CL		0.0	NA	NA
7-8					0.0	NA	NA
9-10					0.0	NA	NA
11-12		12.0' - 14.0'. Wet, hard, gray, brown, Silt and Clay, little Sand (fine-coarse), trace Gravel. Top of Rock at 12.2' Rock Socket 12.2' - 14.0'.	Dolo		0.0	50%	50
13-16		Run 1: 14.0' - 18.9'. Dolomite, hard, gray, fine grained. Small pitted vugs. Fracture at 14.3', horizontal, undulating with sealed vertical fracture below. More vugs at 16.8' - 16.9', one to two styolities.	Dolo		0.0	83%	85%
17-20		Run 2: 18.9' - 23.0'. Full core, no fractures. Dolomite same as above with few to no coral pits. Two stylolites, saccaroidal. Lighter colored inter bedding and ~6.0" lighter colored band at 21.6" -22.3'.	Dolo		0.0	100%	100%
21-24		Run 3: 23.0' - 25.3'. Dolomite same as above with few to no pits. Thin black irregular but smooth bedding planes, appear as if deformed (stromatolite). Open fracture at 23.5, water loss with no return. Partially open fracture at ~25.0.	Dolo		0.0	87%	73%
25-26							

Well: PMW-7D
TOC Height:



Monitoring Well Construction Information

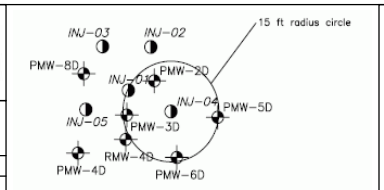
CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 2"
Joints	: Threaded
WELL SCREEN	
Material	: Stainless Steel
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 14 ft.

Notes:
Drill rig: CME-75
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss

PARSONS

Ekonol Pilot Test
Wheatfield, New York

Atlantic Richfield Company
November/December 2007



Date Started	: 11/26/2007
Date Completed	: 11/27/2007
Drilling Method	: Auger, AH, HQ Core
Sampling Method	: Split Spoon, HQ core
Drilling Firm	: NORTHCOAST DRLG
Lead Driller	: Justin Ashcraft
Geologist	: Jim Schuetz
Project Manager	: Mark Raybuck
Reviewed By	: Jim Schuetz
Regulatory Agency	: NYSDEC

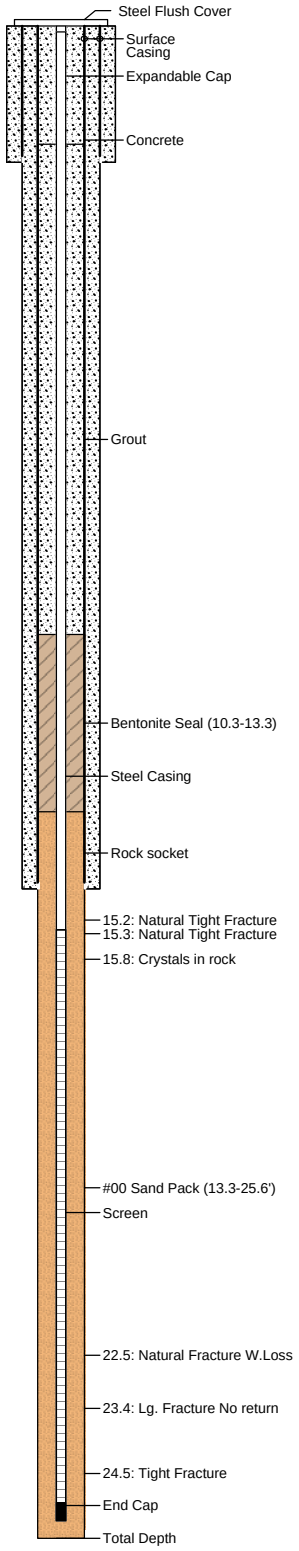
BORING/WELL PMW-8D

PID Model	: MiniRay
PID Calibration	: 100 ppm Isobutylene
Location	: Pilot Test Area NE of
	: Saint Gobain

Water Levels
After Completion: ~6' BTOC

Depth in feet	Surf. Elev.	DESCRIPTION	USCS	GRAPHIC	PID-ppm	Recovery %	Blow Count
0		0.0' - 5.0'. Hand dug.					
		Same as INJ-05.					
1		Moist-wet, red-brown, CLAY and SILT, trace Gravel (fine).					
2					0.0	NA	HAND
3							
4							
5							
6			CL		0.0	NA	NA
7							
8					0.0	NA	NA
9							
10					0.0	NA	NA
11							
12		12.3' - 14.5'. Rock Socket. Top of Rock at 12.3'					
13			Dolo				
14							
15		Run 1: 14.5' - 19.3'. Dolomite, hard, gray. Natural tight fractures at 15.2' and 15.3'. Massive. Crystals imbedded in rock at 15.8', no vugs.					
16							
17			Dolo		0.0	99%	96%
18							
19							
20		Run 2: 19.3' - 24.7'. Dolomite same as above. Natural fracture at 22.5', minor water loss. No return at large smooth fracture at 23.4'. Tight fracture at 24.5', fracture occur in same marker bed with irregular black seams (stromatolite).					
21							
22			Dolo		0.0	85%	70%
23							
24							
25		Run 3: 24.7' - 25.6'. Massive dolomite, same as above, darker gray with more pits.	Dolo		0.0	100%	100%
26							

Well: PMW-8D
TOC Height:

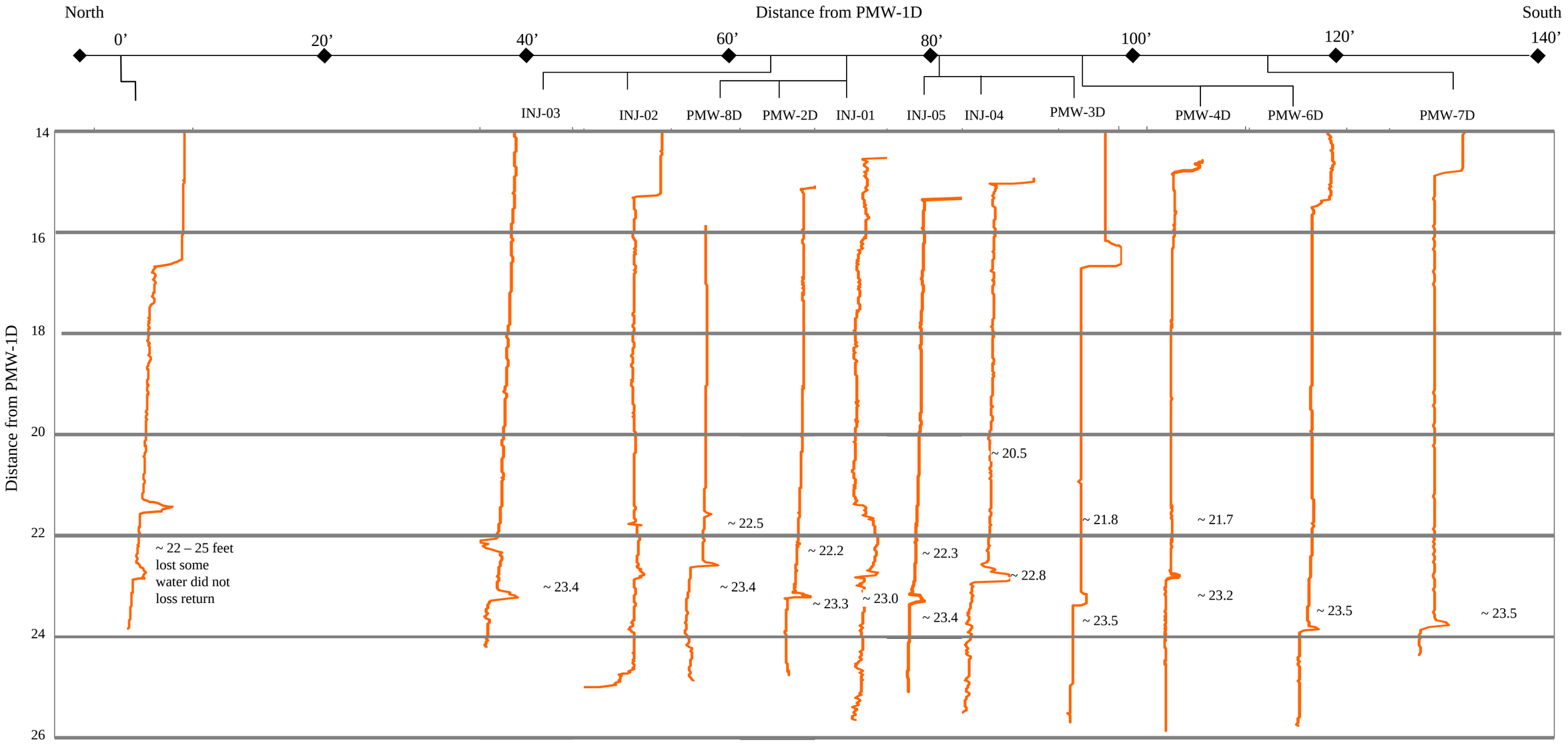


Monitoring Well Construction Information

CONSTRUCTION	
Boring Diameter	: ~8" O.D. upper, ~4" lower
WELL RISER	
Material	: Stainless Steel
Diameter	: 2"
Joints	: Threaded
WELL SCREEN	
Material	: Stainless Steel
Diameter	: 2-Inch
Joints	: Threaded
Opening	: 0.01-inch slots
Length	: 10-feet
SAND PACK	
Material	: #00 Silica Filter Sand
SEAL	
Material	: Bentonite Pellets
GROUT	
Material	: Cement-Bentonite
WELL HEAD	
Protection	: Bolt Down Flush Cover
Well Cap	: Expandable Plug
Well Pad	: 2'x2'x8"
STEEL CASING	
Diameter	: 4-inch
Placment	: Near surface to 15 ft.

Notes:
Drill rig: CME-75
SS - 2" stainless steel split spoon sampler
AH - Air Hammer
W.Loss - drill water loss
Lg. Large
No return - drill water no longer returning up casing.

Caliper Log Summary



Caliper measurements of relative borehole diameter.

~ 23.4 – Indicates water loss observations, upper value indicates depth minor water loss. Lower value is depth of no return.

Caliper Log Summary

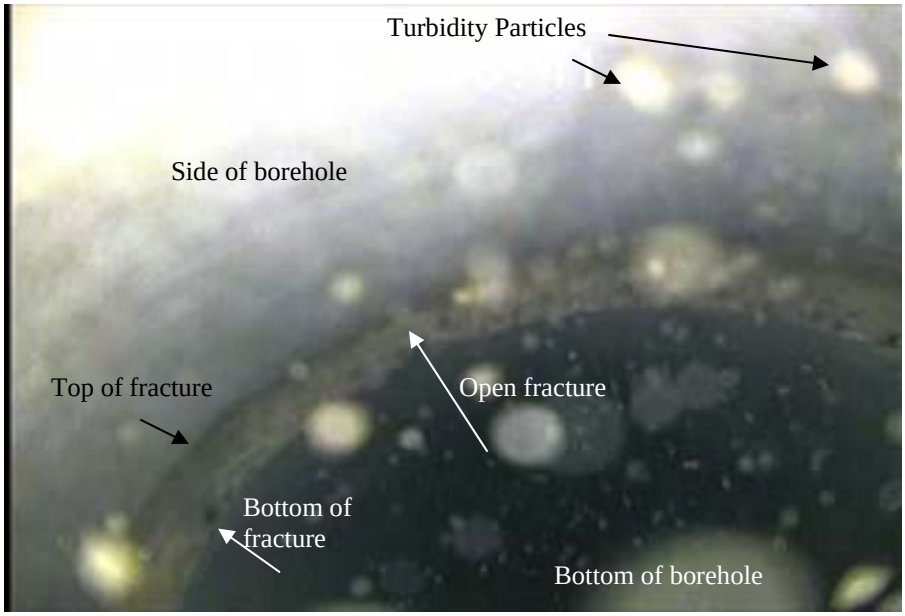
PARSONS

40 La Riviere Dr., Suite 350, Buffalo, N.Y. 14202, Phone: (716) 541-0730

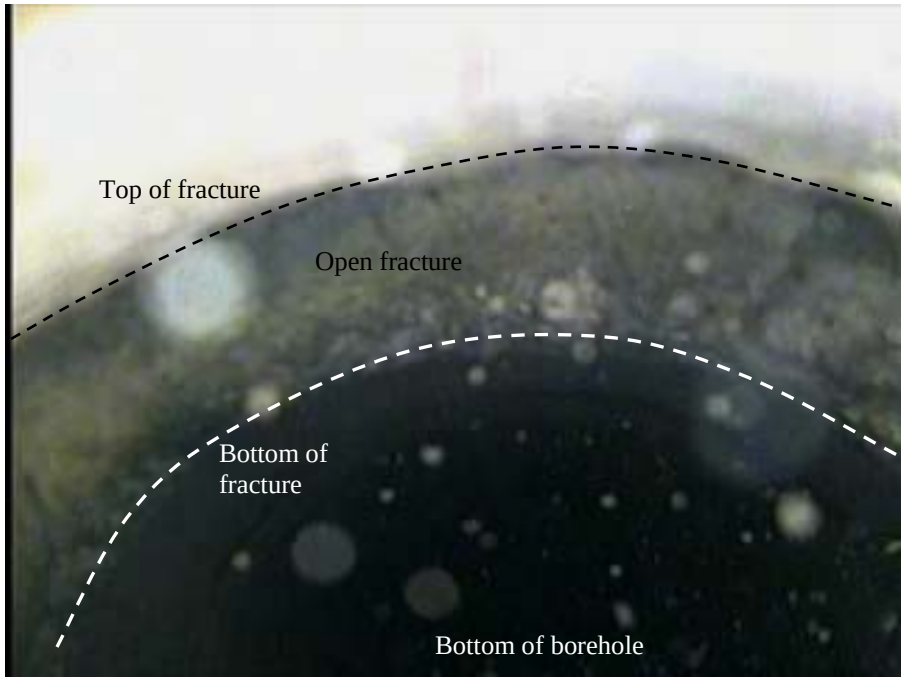
Pilot Test Borehole Photograph Log

Ekonol Polyester Resins Site
Pilot Test Borehole Photograph Log

Date: 1/16/2008 Project Number: 443970
Description: INJ-01 – Open fracture at 21.8 feet below top of well casing.



Date: 1/16/2008 Project Number: 443970
Description: INJ-01 – Large open fracture with rock pieces at 23.0 feet below top of well casing.

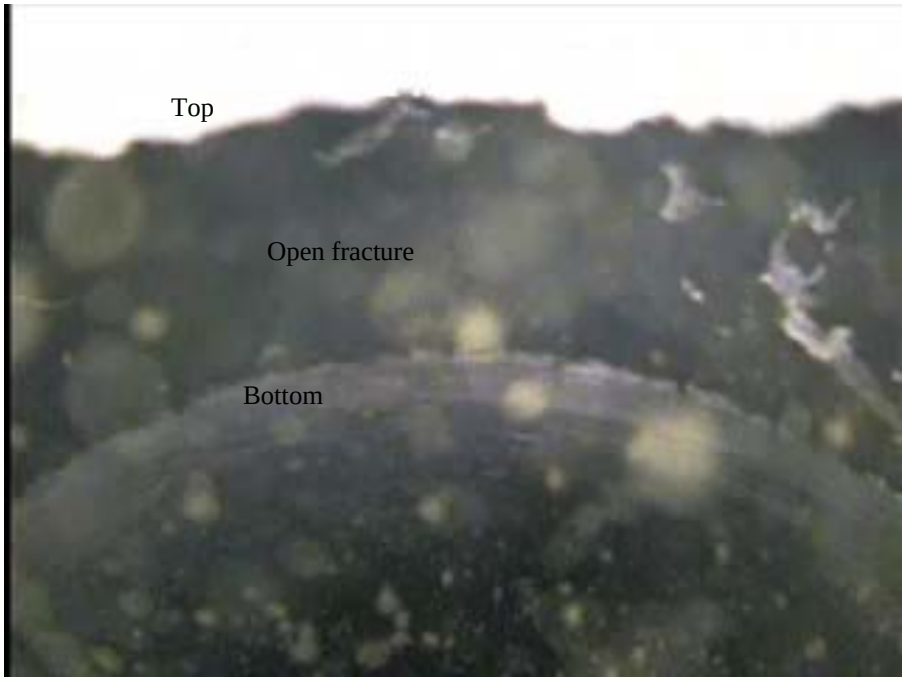


Ekonol Polyester Resins Site
Pilot Test Borehole Photograph Log

Date: 1/16/2008 Project Number: 443970
Description: INJ-02 – Large fracture at 22.0 feet below top of casing. Possible fracture at 22.8 feet below top of casing; too turbid for a clear view.

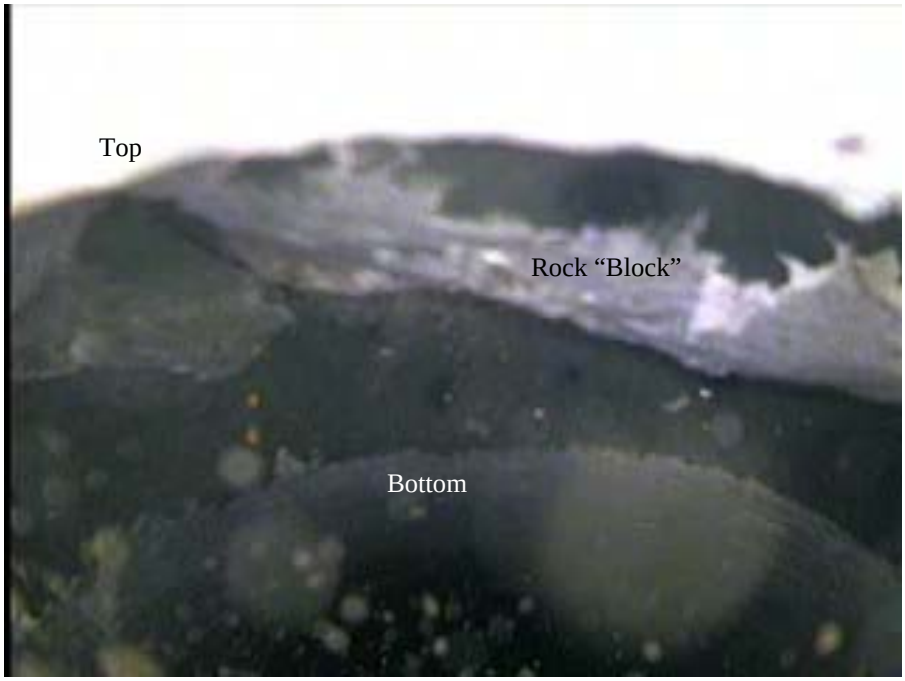
Top

Date: 1/16/2008 Project Number: 443970
Description: INJ-03 – Large fracture at 21.85 feet below top of casing.

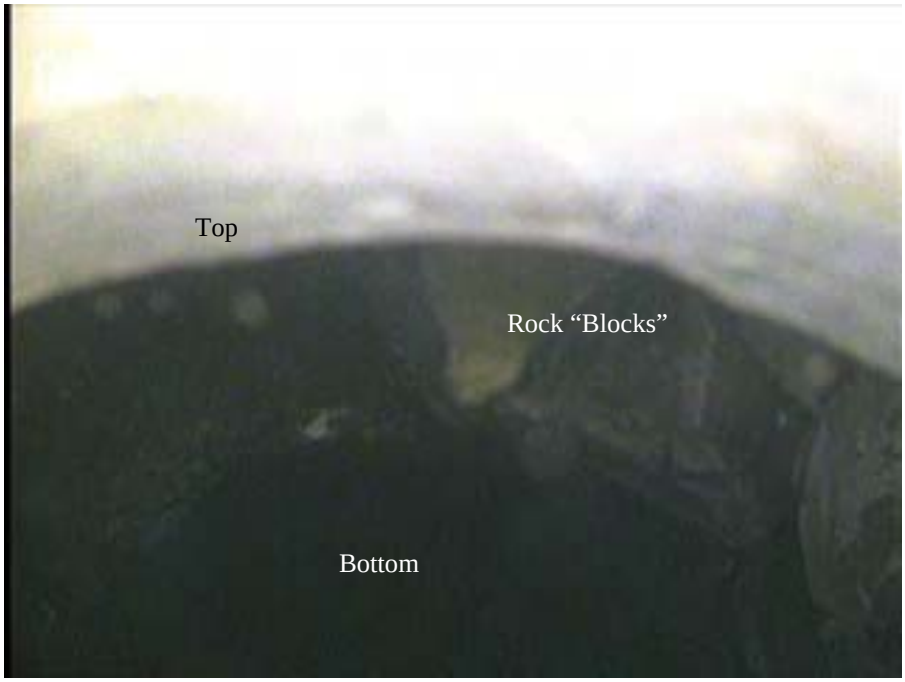


Ekonol Polyester Resins Site
Pilot Test Borehole Photograph Log

Date: 1/16/2008 Project Number: 443970
Description: INJ-03 – Large fracture with blocks at 22.8 feet below top of casing.

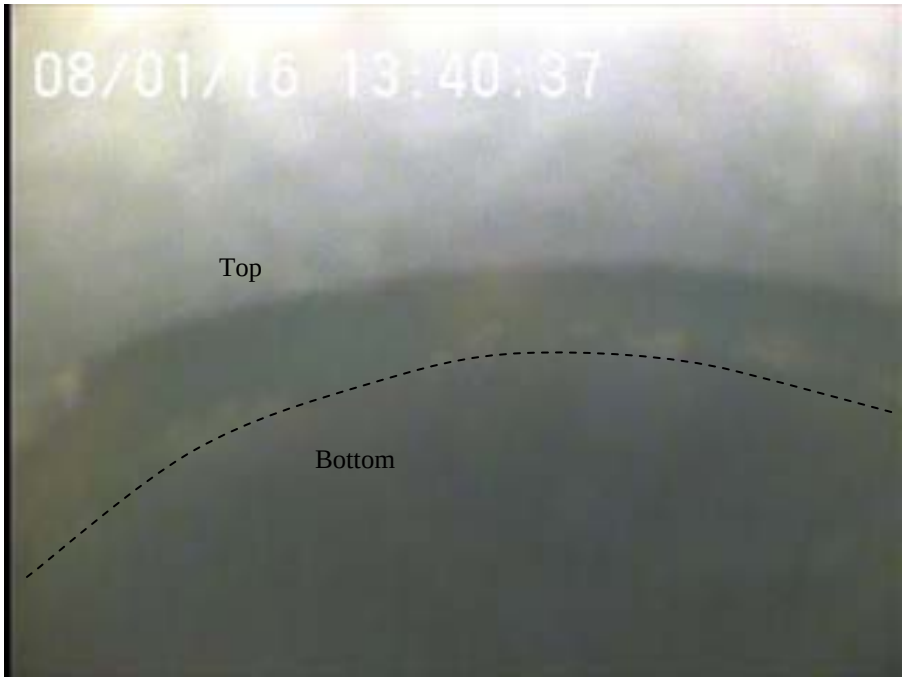


Date: 1/16/2008 Project Number: 443970
Description: INJ-04 – Very large fracture, ~2" – 3" wide, some blocks. Fracture is 22.6 feet below top of casing.

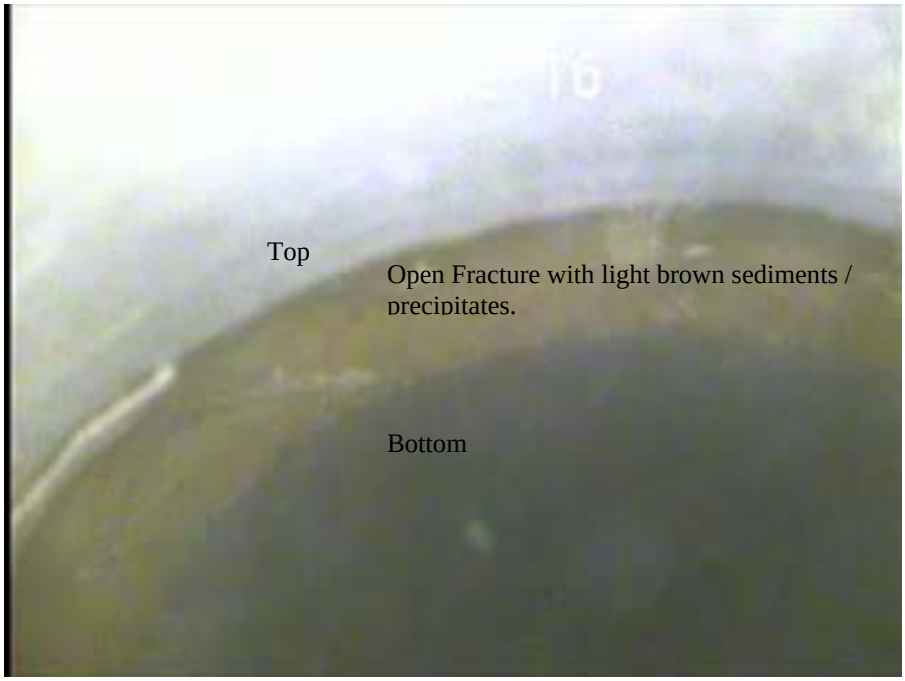


Ekonol Polyester Resins Site
Pilot Test Borehole Photograph Log

Date: 1/16/2008 Project Number: 443970
Description: INJ-05 – Open fracture at 21.6 feet below top of casing.



Date: 1/16/2008 Project Number: 443970
Description: INJ-05 – Open flat fracture at 23.0 feet below top of casing. Fracture is ~1.0" – 1.5" wide. Light brown sediments of precipitates have settled on the bottom surface of the fracture.



Well Development Records

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/9/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/9/2008 12:05
End Date and Time:	1/9/2008 14:05
Flow Rate:	~2.5

Well ID:	PMW-1D
Static water Level	6.24
Total Depth	23.5
Casing Diameter	4"
WATER VOLUME CALCULATION	
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot	

Casing Volumes (gal/ft.):				
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36	
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4	

Well Volume:	11.0464

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	mS/cm	^{o}C	NTU	
12:35	17.95	2.50	20.00	6.89	--	4.23	54.80	Trubid	
12:45	<4.0'	2.50	15.00	6.73	--	3.63	55.40	750.00	
13:25	12.70	2.50	10.00	6.77	--	3.32	54.80	Turbid	surged between samples
13:40	15.90	2.50	35.00	6.77	--	3.23	55.70	850.00	
13:50	19.40	2.50	20.00	6.82	--	3.14	54.40	500.00	
14:00	21.76	2.50	20.00	6.79	--	3.29	54.20	500.00	
14:05	22.80	2.50	5.00	6.81	--	3.07	54.00	250.00	
		Total	135.00						

Comments: Drillers purged ~200 gallons from well after drilling. After taking total depth possible product on probe.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/9/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/9/2008 9:45
End Date and Time:	1/9/2008 10:05
Flow Rate:	~2.5 gpm

Well ID:	PMW-2D
Static water Level	6.65
Total Depth	24
Casing Diameter	2"

WATER VOLUME CALCULATION

= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Casing Volumes (gal/ft.):			
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4

Well Volume: 2.776

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	mS/cm	°C	NTU	
9:55	11.20	2.50	15.00	7.11	--	2.20	53.50	550.00	
10:00	10.52	2.50	15.00	7.08	--	2.35	54.70	230.00	
10:05	N/A	2.50	10.00	7.06	--	2.34	55.30	23.00	
		Total	40.00						

Comments: Drillers purged ~200 gallons from well after drilling.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/8/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/8/2008 15:20
End Date and Time:	1/8/2008 15:55
Flow Rate:	~2.4

Well ID:	PMW-3D
Static water Level	6.75
Total Depth	25
Casing Diameter	2"
WATER VOLUME CALCULATION	
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot	

Casing Volumes (gal/ft.):				
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36	
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4	

Well Volume:	2.92

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	mS/cm	^{o}C	NTU	
15:30	13.5'	2.40	20.00	7.50	--	2.41	58.80	700.00	
15:35	15.2'	2.40	20.00	7.21	--	2.35	58.60	120.00	
15:40	12.6'	2.40	20.00	7.20	--	2.36	58.30	31.00	
15:55	13.6'	2.40	30.00	7.19	--	2.35	58.70	16.00	
		Total	90.00						

Comments: Drillers purged ~200 gallons from well after drilling.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/9/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/9/2008 8:50
End Date and Time:	1/9/2008 9:35
Flow Rate:	~2.5

Well ID:	PMW-4D
Static water Level	6.46
Total Depth	25
Casing Diameter	2"

WATER VOLUME CALCULATION

= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Casing Volumes (gal/ft.):				
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36	
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4	

Well Volume: 2.9664

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	mS/cm	^{o}C	NTU	
9:15	9.98	2.50	50.00	7.25	--	2.47	52.60	130.00	
9:25	9.78	2.50	30.00	7.06	--	2.41	53.40	110.00	
9:35	9.45	2.50	20.00	7.13	--	2.46	52.40	32.00	
		Total	100.00						

Comments: Drillers purged ~200 gallons from well after drilling. Conductivity calibration 12.88 = 13.55, made note in field book.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/9/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/9/2008 10:15
End Date and Time:	1/9/2008 10:50
Flow Rate:	~2.5

Well ID:	PMW-5D
Static water Level	6.56
Total Depth	24.96
Casing Diameter	

WATER VOLUME CALCULATION

= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Casing Volumes (gal/ft.):				
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36	
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4	

Well Volume: 2.944

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	mS/cm	^{o}C	NTU	
10:25	7.96	2.50	15.00	7.04	--	1.99	53.40	750.00	
10:35	8.04	2.50	20.00	7.07	--	2.03	53.70	450.00	
10:45	8.20	2.50	15.00	7.06	--	2.08	53.80	190.00	
10:50	8.08	2.50	--	7.05		2.17	53.60	80.00	
		Total	65.00						

Comments: Drillers purged ~200 gallons from well after drilling.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/9/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/9/2008 11:05
End Date and Time:	1/9/2008 11:30
Flow Rate:	~2.5

Well ID:	PMW-6D
Static water Level	6.62
Total Depth	25
Casing Diameter	2"

WATER VOLUME CALCULATION

= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Casing Volumes (gal/ft.):				
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36	
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4	

Well Volume: 2.9408

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	mS/cm	°C	NTU	
11:15	13.80	2.50	40.00	7.05	--	2.28	54.00	Turbid	
11:20	10.75	2.50	15.00	7.09	--	2.22	55.40	90.00	
11:30	11.20	2.50	20.00	7.06	--	2.22	54.60	50.00	
		Total	75.00						

Comments: Drillers purged ~200 gallons from well after drilling.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	Jim Schuetz, Ethan Shapiro
Date:	1/7/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/7/2008 11:45
End Date and Time:	1/7/2008 12:25
Flow Rate:	5G/1 min 52 sec = 2.68 GPM

Well ID:	PMW-7D
Static water Level	6.76
Total Depth	24.3
Casing Diameter	2"
WATER VOLUME CALCULATION	
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot	

Casing Volumes (gal/ft.):				
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36	
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4	

Well Volume: 2.8064

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	mS/cm	^{o}C	NTU	
11:50	10.98	~2.7	20.00	7.43	--	3.37	58.80	700.00	Developed 100 GAL prior to setting well
12:15	10.94	--	40.00	7.18	--	2.74	57.50	85.00	
12:25	10.80	--	--	7.09	--	2.73	57.80	35.00	
		Total	100.00						

Comments: Drillers purged ~200 gallons from well after drilling.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/8/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/8/2008 14:50
End Date and Time:	1/8/2008 15:05
Flow Rate:	~2.4 gpm

Well ID:	PMW-8D
Static water Level	6.2
Total Depth	25.5
Casing Diameter	

WATER VOLUME CALCULATION

= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Casing Volumes (gal/ft.):				
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36	
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4	

Well Volume: 3.088

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.		gal.		mg/L	mS/cm	°C	NTU	
14:45	9.95	2.40	--	7.20	--	2.69	59.80	230.00	sheen on water
14:58	9.72	2.40	40.00	7.17	--	2.59	59.20	90.00	
15:05	9.80	2.40	75.00	7.18		2.54	58.90	29.00	
		Total	135.00						

Comments: Pump @ INJ-03 - DTWIN PMW-8D was 6.77'; 10 minutes after pump was removed water level came

Drillers purged ~200 gallons from well after drilling.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/8/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/8/2008 10:45
End Date and Time:	1/8/2008 11:45
Flow Rate:	~2.4

Well ID:	INJ-01	
Static water Level	6.46	from highest point of steel (north side)
Total Depth	25.14	
Casing Diameter	4"	
WATER VOLUME CALCULATION		
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot		

Casing Volumes (gal/ft.):				
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36	
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4	

Well Volume: 11.9552

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.		gal.		mg/L	mS/cm	^{o}C	NTU	
10:56	7.04	2.40	--	7.12	--	2.49	59.00	30.00	was turbid at first, very lt. silt
11:10	7.04	2.40	--	7.21	--	2.51	58.60	22.00	
11:25	7.04	2.40	--	7.15	--	2.47	58.30	8.00	
11:45	7.04	2.40	--	7.15	--	2.45	58.60	5.20	
		Total	144.00						

Comments: At ~15' slight obstruction in well

Drillers purged ~200 gallons from well after drilling.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/8/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/8/2008 9:00
End Date and Time:	1/8/2008 10:25
Flow Rate:	~2.5

Well ID:	INJ-02
Static water Level	6.52
Total Depth	25.5
Casing Diameter	4"
WATER VOLUME CALCULATION	
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot	

Casing Volumes (gal/ft.):				
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36	
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4	

Well Volume: 12.147

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.		gal.		mg/L	mS/cm	°C	NTU	
9:15	6.59	2.50		7.46	--	2.87	57.50	450.00	
9:40	6.75	2.50	~50	7.38	--	2.59	58.50	130.00	
10:00		2.50		7.28	--	2.48	58.80	90.00	removed all of silt 10:10
10:15	6.95	2.50	~100	7.27	--	2.60	58.90	23.00	
10:20		2.50		7.25	--	2.59	59.10	16.00	
10:25	6.95	2.50	~150	7.25	--	2.57	58.90	16.00	
		Total	300.00						

Comments: slight sheen on water, strong chemical odor

Drillers purged ~200 gallons from well after drilling.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/8/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/8/2008 13:25
End Date and Time:	1/8/2008 14:20
Flow Rate:	~2.4

Well ID:	INJ-03
Static water Level	6.02
Total Depth	27
Casing Diameter	4"

WATER VOLUME CALCULATION

= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Casing Volumes (gal/ft.):				
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36	
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4	

Well Volume: 13.4272

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.		gal.		mg/L	mS/cm	^{o}C	NTU	
13:32	6.08	2.40	--	7.15	--	3.07	59.80	Turbid	
13:55	6.72	2.40	--	7.16	--	2.62	58.70	70.00	
14:10	6.70	2.40	--	7.19	--	2.60	59.60	36.00	
14:20	6.74	2.40	--	7.17	--	2.54	59.00	31.00	
		Total	115.00						

Comments: Sheen on water.

Drillers purged ~200 gallons from well after drilling.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/7/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/7/2008 14:10
End Date and Time:	1/7/2008 14:55
Flow Rate:	~2.7

Well ID:	INJ-04
Static water Level	6.43
Total Depth	24.83
Casing Diameter	4"

WATER VOLUME CALCULATION

= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Casing Volumes (gal/ft.):				
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36	
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4	

Well Volume: 11.776

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.	GPM	gal.		mg/L	mS/cm	°C	NTU	
14:20	7.24	2.70	25.00	7.03	--	2.82	58.60	150.00	Turbid at first
14:30	7.25	2.70	50.00	7.11	--	2.78	58.30	35.00	
14:40	7.26	2.70	75.00	7.13	--	2.69	58.00	32.00	
14:50	--	2.70	100.00	7.14	--	2.63	58.10	23.00	
		Total	100.00						

Comments: Drillers purged ~200 gallons from well after drilling.

PARSONS

WELL DEVELOPMENT RECORD

Project Name:	Ekonol
Job Number:	443970
Personnel:	JWS. EPS
Date:	1/7/2008
Development type:	over purmping/surging
Pump type:	submersible - mini typhon
Start Date and Time:	1/7/2008 15:00
End Date and Time:	1/7/2008 16:21
Flow Rate:	~2.7 gpm

Well ID:	INJ-05
Static water Level	7.9
Total Depth	23.22
Casing Diameter	4"

WATER VOLUME CALCULATION

= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Casing Volumes (gal/ft.):			
1-inch = 0.041	1.5-inch = 0.092	2-inch = 0.16	3-inch = 0.36
4-inch = 0.64	6-inch = 1.4	8-inch = 2.5	10 inch = 4

Well Volume: 9.8048

Time	DTW	Pump Rate	Vol.	pH	DO	Spec. Cond.	Temp.	Turb.	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	mS/cm	^{o}C	NTU	
15:10	--	2.70	15.00	8.83	--	3.36	58.20	Turbid	
15:25	--	2.70	50.00	7.35	--	3.05	58.40	Turbid	
16:05	7.05	2.70	70.00	7.21	--	2.63	58.50	360.00	
16:15	--	2.70	--	7.15	--	2.58	58.10	80.00	
16:21	--	2.70	--	7.16	--	2.57	58.30	45.00	
		Total	200.00						

Comments: Sheen on water.

Drillers purged ~200 gallons from well after drilling.

PARSONS

Appendix B

- Substrate Breakthrough Plots
- Porosity Calculations

EKONOL POLYESTER RESINS SITE
PROJECT NUMBER 443970
BIOREMEDIATION PILOT TEST
2008

POROSITY CALCULATION

Porous media conceptual model
This sheet calculates effective porosity given:

$$n_e = \frac{V}{\pi r^2 \cdot H}$$

n_e	=	porosity				
r	=	Radius	=		feet	Measured distance between monitoring wells and INJ-01
H	=	Thickness	=	10	feet	Based on drill logs.
V	=	Volume of substrate	=		cubic feet	Volume is based on breakthrough times read from real-time data see the breakthrough plots presented later in this appendix: Breakthrough_monitoring.xls

Well ID	Distance (r)	Time of Breakthrough	Volume Pumped (gal.)	Volume (cu. ft.)	Estimated Porosity (unitless)
PMW-2D	8.6	16:12	182	24	0.010
PMW-3D	14.8	16:14	186	25	0.004
PMW-8D	14.9	16:56	274	37	0.005
PMW-4D	24.6	16:23	205	27	0.001
PMW-6D	25.2	16:30	219	29	0.001

Based on assumed 10' fractured rock unit.

For comparison the aperture of an open smooth fracture based on PMW-2D observations is estimated at:
0.10434 feet

EKONOL POLYESTER RESINS SITE
PROJECT NUMBER 443970
BIOREMEDIATION PILOT TEST
2008

INJECTION TIMES, VOLUMES, AND BREAKTHROUGH SUMMARY

Field Data

Times and flow rates for calculating volumes.

Actual injection volumes and time of break-through

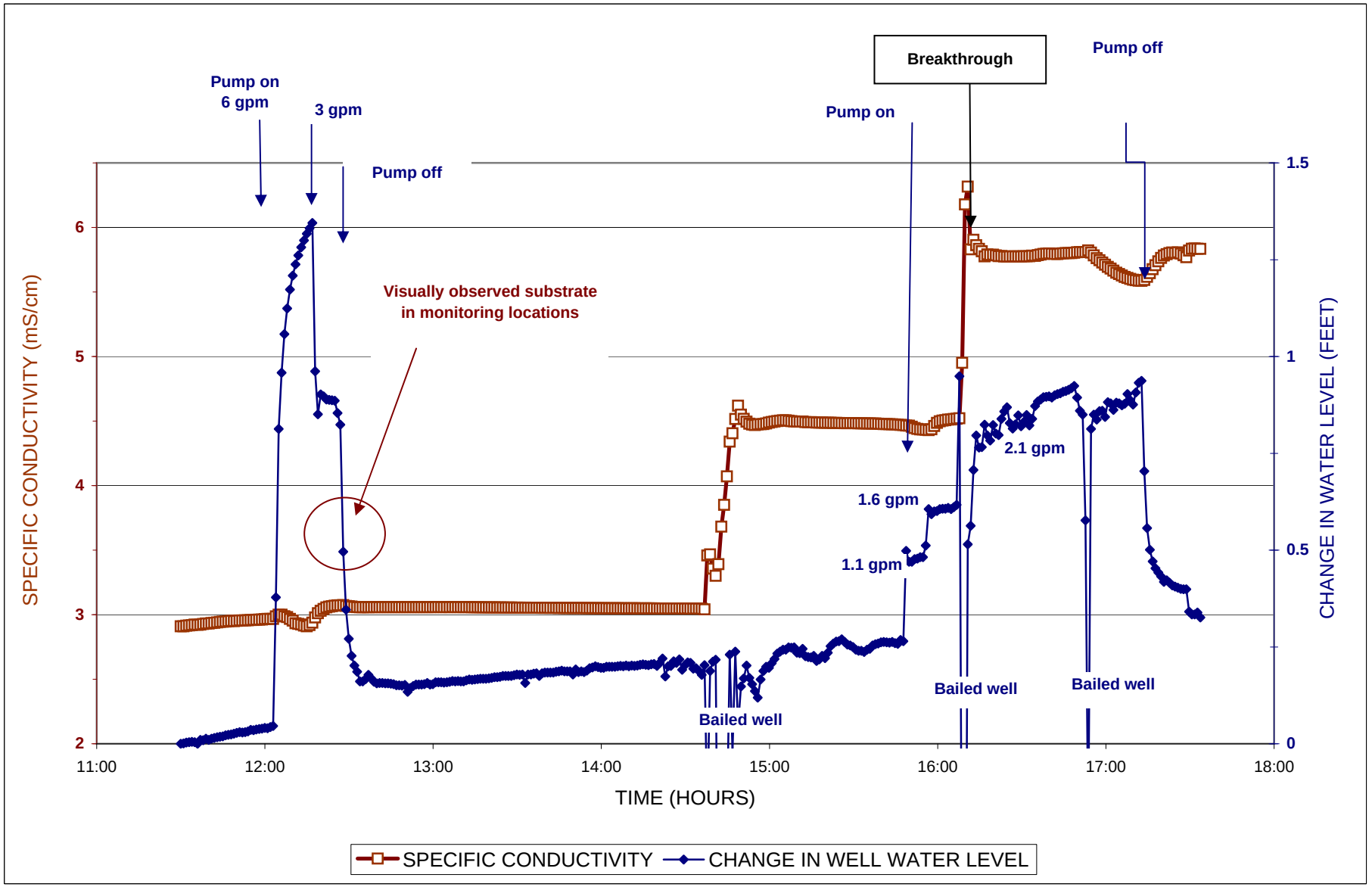
Time	Flow rate (gpm)	Flow Rate Cumulative Volume (gpm)	Metered Volume (gallons)	Observations
6/17/2008 12:03	5.5	----	----	Injection start
6/17/2008 12:25		----	----	Visual of SRS at PMW-3D
6/17/2008 12:28	5.5	137	130	Stopped pump
6/17/2008 15:46	1.1	137	----	Re-Started
6/17/2008 15:52	1.6	144	----	Increased pump rate
6/17/2008 16:00	2.1	156	----	Increased pump rate
6/17/2008 16:12	2.1	182	----	Breakthrough PMW-2D from breakthrough plots
6/17/2008 16:14	2.1	186	----	Breakthrough PMW-3D from breakthrough plots
6/17/2008 16:23	2.1	205	----	Breakthrough PMW-4D from breakthrough plots
6/17/2008 16:30	2.1	219	----	Breakthrough PMW-6D from breakthrough plots
6/17/2008 16:56	2.1	274	----	Breakthrough PMW-8D from breakthrough plots

Notes:
The times of breakthrough were depicted from the conductivity plots. It appears that bailing the well was related to the increases of conductivity. This likely due to a lack of mixing in the well (prior to bailing), and the conductivity probe being slightly above or below the fracture where the substrate was flowing.

Since the bailing was related to when the breakthrough was realized in the well, the times and volumes may be more dependant on when the well was bailed than the actual porosity of the rock. This circumstance introduces error into the calculation, and therefore use of these estimates should account for the potential error. By depicting the time of breakthrough at the highest concentration, which is also typically after the well was bailed, it is likely that the porosity estimate is biased high, and therefore overestimating porosity.

EKONOL POLYESTER RESINS FACILITY
PILOT TEST

OBSERVATIONS OF WATER LEVEL AND SPECIFIC CONDUCTIVITY AT PMW-2D DURING INJECTION AT INJ-01



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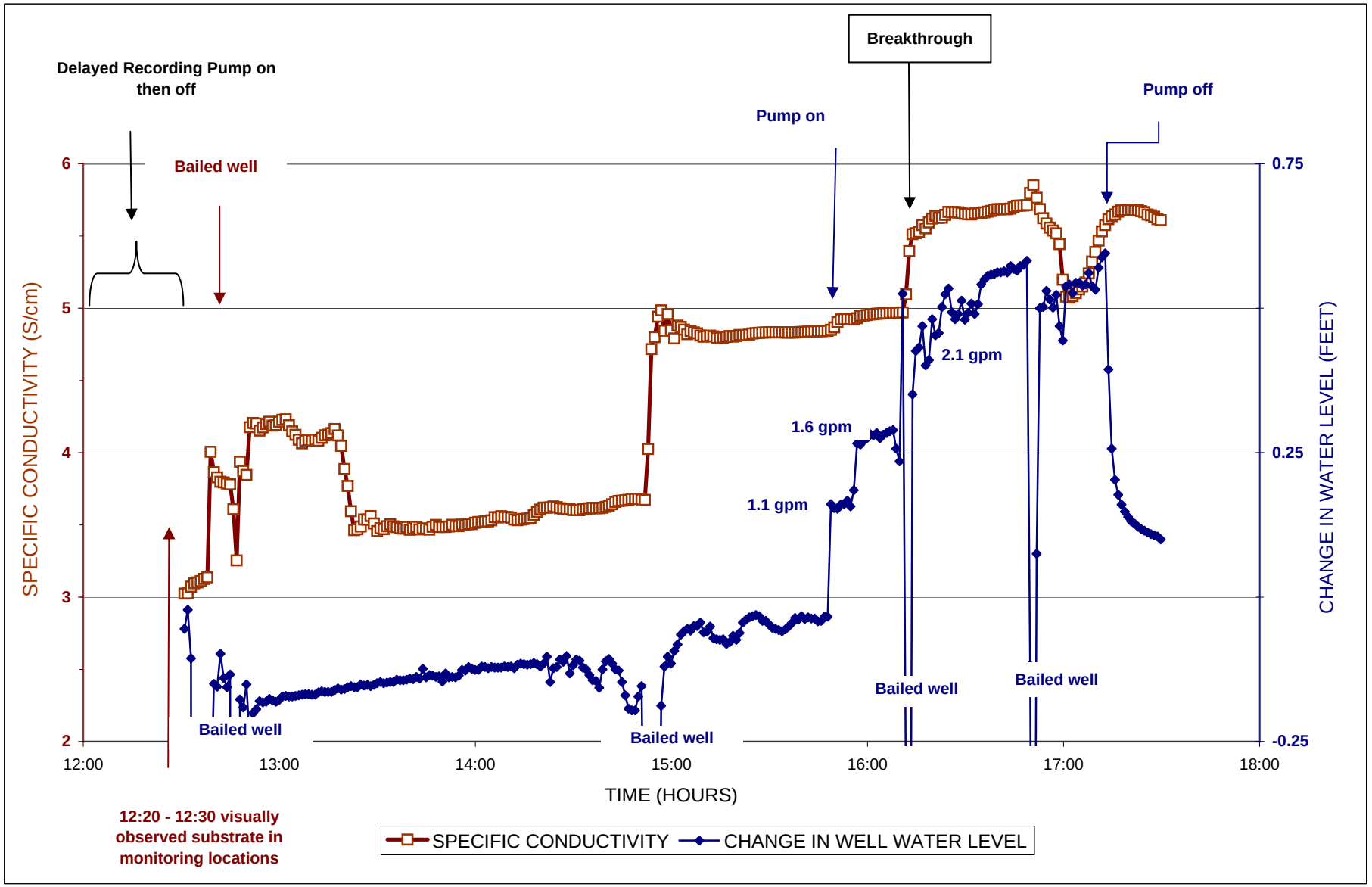
April 2009

EKONOL POLYESTER RESINS FACILITY
PILOT TEST

OBSERVATIONS OF WATER LEVEL AND SPECIFIC CONDUCTIVITY AT PMW-3D DURING INJECTION AT INJ-01



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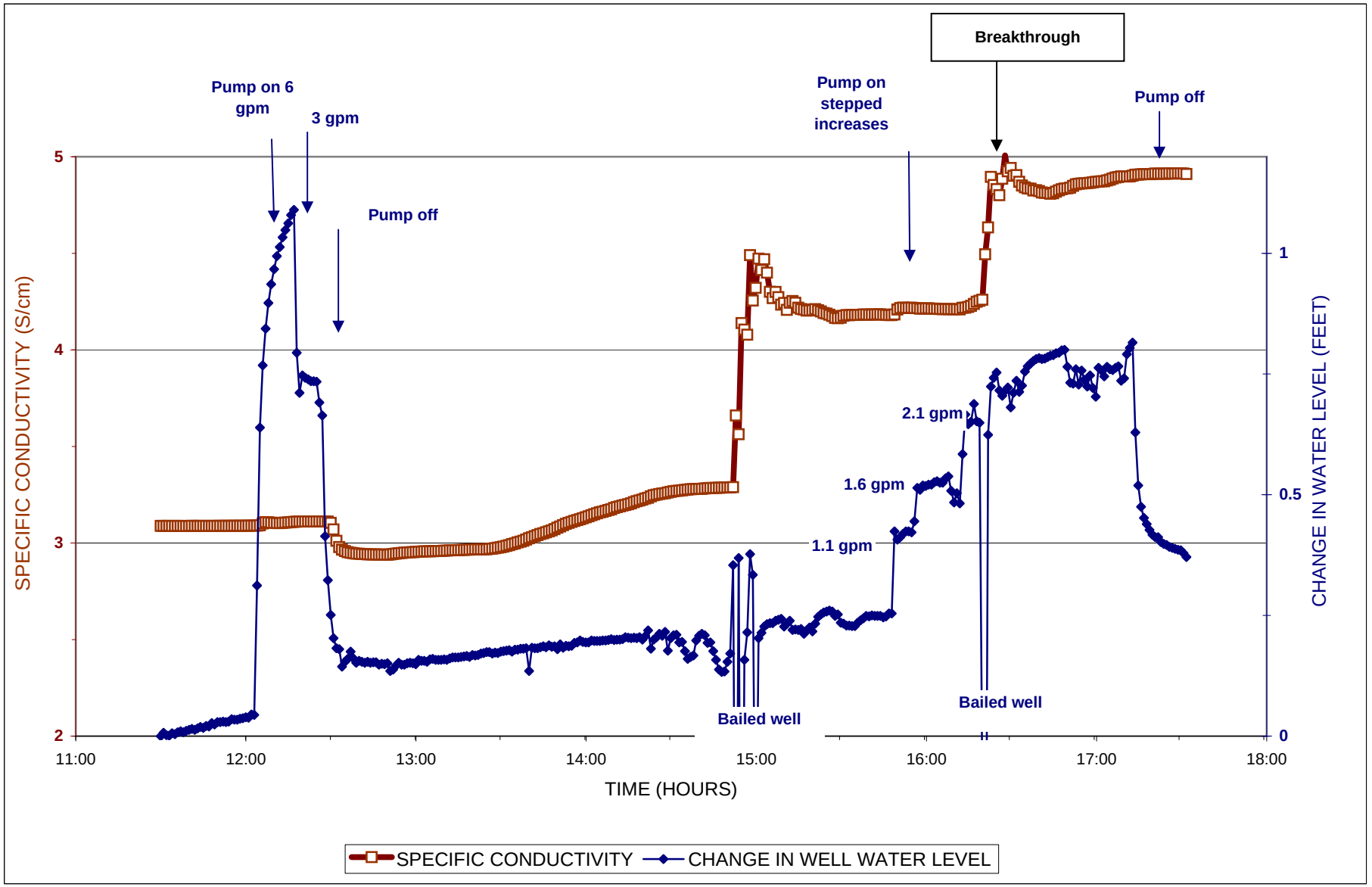
April 2009

EKONOL POLYESTER RESINS FACILITY
PILOT TEST

OBSERVATIONS OF WATER LEVEL AND SPECIFIC CONDUCTIVITY AT PMW-4D DURING INJECTION AT INJ-01



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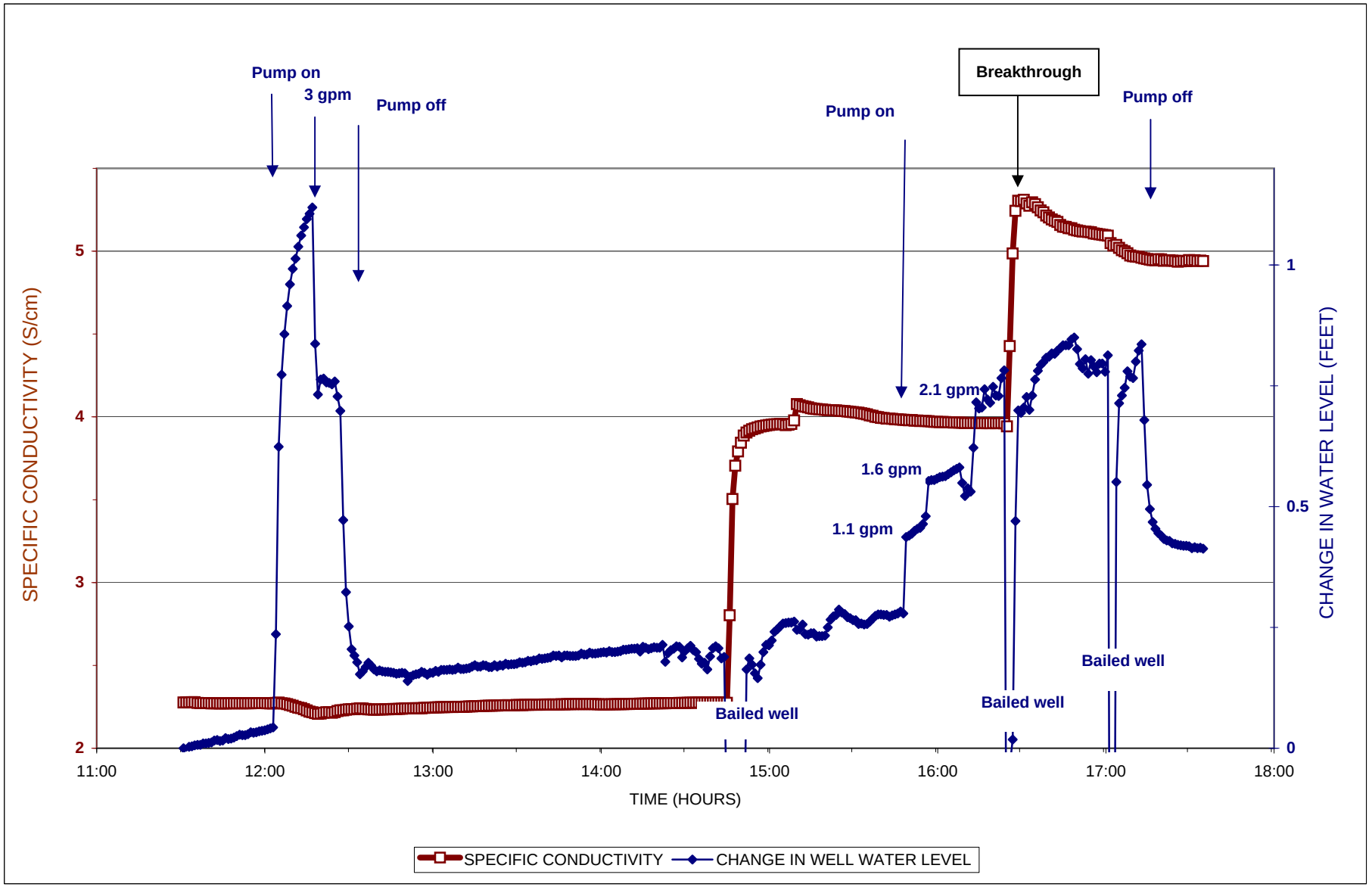
April 2009

EKONOL POLYESTER RESINS FACILITY
PILOT TEST

OBSERVATIONS OF WATER LEVEL AND SPECIFIC CONDUCTIVITY AT PMW-6D DURING INJECTION AT INJ-01



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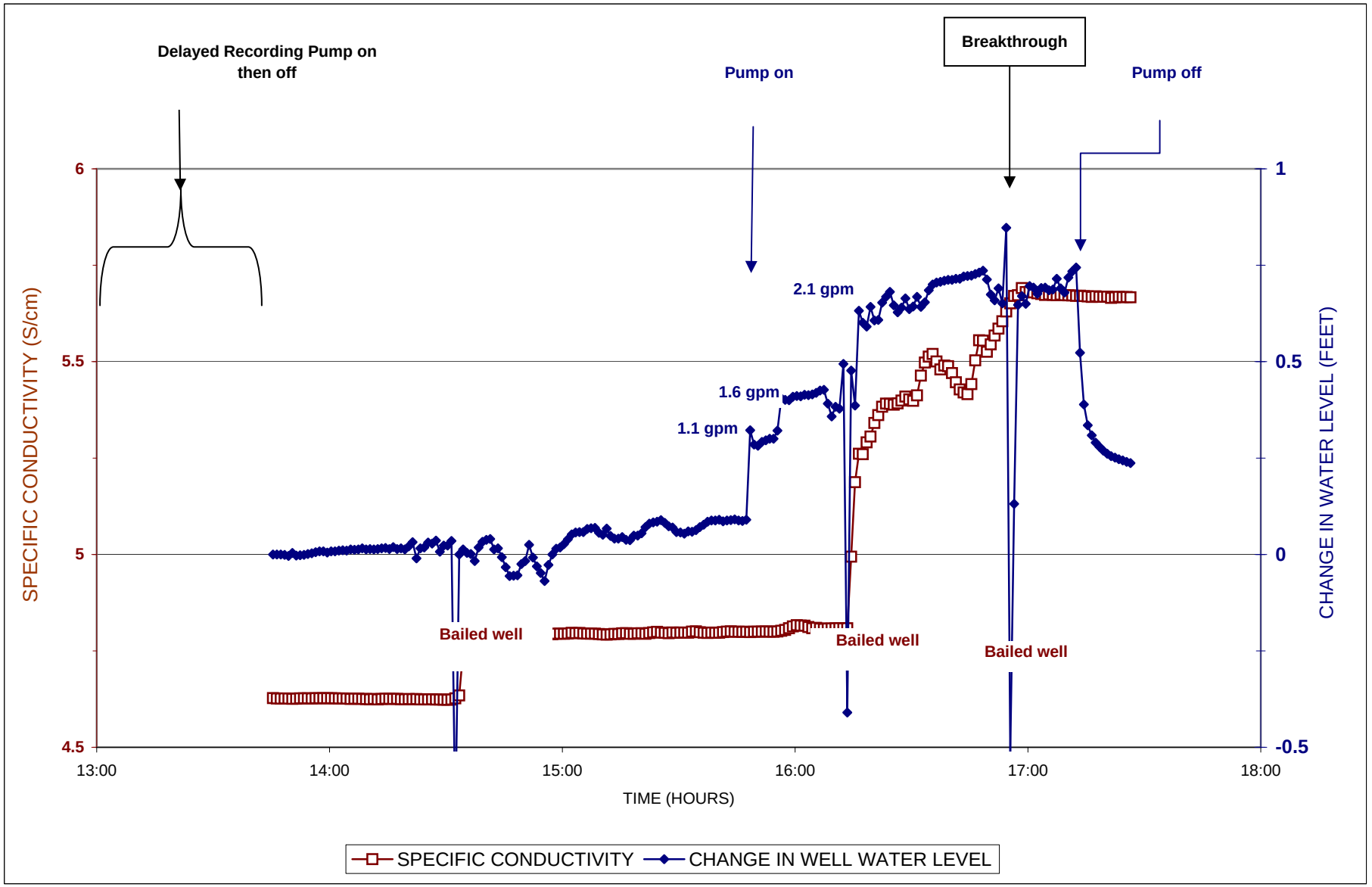
April 2009

EKONOL POLYESTER RESINS FACILITY
PILOT TEST

OBSERVATIONS OF WATER LEVEL AND SPECIFIC CONDUCTIVITY AT PMW-8D DURING INJECTION AT INJ-01



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April 2009

Appendix C

- Low-Flow GW Sampling Sheets

Baseline Monitoring Event

LOW FLOW WELL SAMPLING RECORD

Site Name Ekonol Well ID: INJ-01 Well Diameter: 4" Inches

Samplers: Monitored Natural Attenuation Sample Set (Y/N)? Y

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
Static WL 6.78

Method: Peristaltic Pump Date/Time: 1/15/08 11:15

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
11:15	6.84	600	0.7	7.76	0.00	643	2.67	12.8	1.7	-188	
11:25	6.84	600	1.8	7.75	0.00	626	2.93	13.2	1.9	-190	
11:35	6.84	600	3.0	7.20	0.00		4.62	13.7	3.8	-174	
11:45	6.85	600	5.0	7.16	0.00	34	4.76	13.5	3.0	-177	
11:53	6.85	600	7.0	7.16	0.00	28	4.76	12.9	3.0	-180	
12:00	6.85	600	8.5	7.18	0.00	27	4.59	13.1	2.9	-182	
12:25	6.85	600		7.21	0.00	<20	3.64	12.9	2.5	-185	
12:32	6.85	600	14.0	7.22	0.00	17	3.84	12.8	2.5	-184	

Sampling Data

Method: Peristaltic Pump Date/Time: 1/15/08 12:45 Total Volume of Water purged: 15 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	7.22	Ferrous Iron (mg/L)	1.0
Spec. Cond.(mS/cm)	3.84	Manganese (mg/L)	0
Turbidity (NTU)	17	Alkalinity at $CaCO_3$ (mg/L)	340
DO (mg/L)	0.00	Hydrogen Sulfide (mg/L)	0.1
Temp.(°C)	12.8	Sulfate (mg/L)	>200
TDS (g/L)	2.5	CO_2 (mg/L)	382
ORP (mv)	-184		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids	1-250 Amber	none	lab specified
Microbes	Filtered 1400 ML	Ice	lab specified

Comments: Obstruction in well at ~15' could not get tubing past. 1/17 JWS note: not an osbruction, space between steel casing and bottom of rock socket

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: INJ-02 | Well Diameter: 4" Inches

Samplers: JWS | Monitored Natural Attenuation Sample Set (Y/N)? N

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
Static WL 6.88

Method: Peristaltic Pump | Date/Time: 1/16/08 11:05

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
11:08	6.92	800	1.0	7.39	1.95	25	4.21	13.9	2.7	-147	
11:13	6.93	800	1.5	7.23	0.29		4.20	14.2	2.7	-148	
11:18	6.90	300		7.05	0.00	7	4.39	14.2	2.8	-139	
11:23	6.90	300	3.0	7.03	0.00	8.2	4.40	13.9	2.8	-141	
11:28	6.90	300	4.0	7.01	0.00	6	4.36	13.9	2.8	-146	

Sampling Data

Method: Peristaltic Pump | Date/Time: 1/15/08 11:40 | Total Volume of Water purged: 4.2 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	7.01		
Spec. Cond.(mS/cm)	4.36		
Turbidity (NTU)	6		
DO (mg/L)	0.00		
Temp.(°C)	13.9		
TDS (g/L)	2.8		
ORP (mv)	-146		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET

Parameter	Bottle	Pres.	Method
Microbes	Filtered 1800 ML		

Comments:

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name Ekonol | Well ID: PMW-1D | Well Diameter: 4" Inches

Samplers: JWS | Monitored Natural Attenuation Sample Set (Y/N)? Y

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
Static WL 6.64

Method: Peristaltic Pump | Date/Time: 1/15/08 8:00

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
8:15	6.84	400	0.5	6.43	0.38	73.3	4.70	12.2	3.0	-88	
9:20	6.88	400	0.8	6.63	0.00	12.0	4.82	12.8	3.0	-107	
8:30		400	1.5	6.75	0.00	4.1	4.64	13.0	3.0	-124	
8:35	6.95	400	2.5	6.81	0.00	9.5	4.25	13.3	2.7	-135	
8:40	6.95	400	3.0	6.83	0.00	3.0	4.12	13.2	2.6	-138	
8:50	6.95	400	4.5	6.85	0.00	10.1	3.99	13.3	2.6	-142	

Sampling Data

Method: Peristaltic Pump | Date/Time: 1/15/08 9:00 | Total Volume of Water purged: 6 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.85	Ferrous Iron (mg/L)	2.0
Spec. Cond.(mS/cm)	3.99	Manganese (mg/L)	0
Turbidity (NTU)	10.1	Alkalinity at $CaCO_3$ (mg/L)	420
DO (mg/L)	0.00	Hydrogen Sulfide (mg/L)	0.3
Temp.(°C)	13.3	Sulfate (mg/L)	>200
TDS (g/L)	2.6	CO_2 (mg/L)	240
ORP (mv)	-142		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified
Disolved Metals - total iron (Field filtered, Select wells only)	1-500 ML plstic	Nitric acid	EPA 200.7 or 200.9

Comments: Did Sudan IV test at beginning of sample. No DNAPL but Pink hue on "ball" indicates TPH > 500 ppm

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-2D | Well Diameter: 2 Inches

Samplers: DC Burkert | Monitored Natural Attenuation Sample Set (Y/N)? Y

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Peristaltic Pump | Date/Time: 1/16/08 10:30

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
10:35	7.16	250	--	7.66	3.19	555	2.7	11.6	1.8	-139	
10:50	7.23	250	3.75 L	7.57	1.10	176	11.6	11.6	2.2	-157	
11:00	7.23	250	6.25 L	7.52	0.97	189	11.6	11.6	2.4	-175	
11:15	7.23	250	8.75 L	7.53	0.93	119	0.2	12.0	2.5	-178	
11:20	7.23	250	10 L	7.52	0.94	98.7	11.9	11.9	2.6	-182	
			11.25	7.47	1.00	63.4	11.8	11.8	2.5	-183	D.O. suspect

Sampling Data

Method: Peristaltic Pump | Date/Time: 1/16/08 11:30 | Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH	7.47	Ferrous Iron (mg/L)	1.0
Spec. Cond.(mS/cm)	4.04	Manganese (mg/L)	0
Turbidity (NTU)	20 (LaMott)	Alkalinity at $CaCO_3$ (mg/L)	340
DO (mg/L)	1.0 (suspect)	Hydrogen Sulfide (mg/L)	0.2
Temp.(°C)	11.8	Sulfate (mg/L)	>200
TDS (g/L)	2.5	CO_2 (mg/L)	212
ORP (mv)	-183		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments:

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name Ekonol Well ID: PMW-3D Well Diameter: 2 Inches

Samplers: DC Burkert Monitored Natural Attenuation Sample Set (Y/N)? Y

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Peristaltic Pump Date/Time: 1/15/08 14:15

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
14:15	7.08	220	--	7.30	3.39	403	2.88	11.3	1.8	-243	
14:30	7.16	220	3.3 L	7.48	0.99	199	2.84	11.3	1.8	-246	
14:45	7.18	220	6.6 L	7.47	0.90	180	2.83	11.6	1.8	-255	
14:50	7.18	220	9.9 L	7.46	0.90	166	2.82	11.8	1.8	-252	
14:55	7.18	220	13.2	7.46	0.87	107	2.83	11.9	1.8	-255	

Sampling Data

Method: Peristaltic Pump Date/Time: 1/15/08 15:00 Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH	7.46	Ferrous Iron (mg/L)	0.4
Spec. Cond.(mS/cm)	2.83	Manganese (mg/L)	0
Turbidity (NTU)	3 NTU (1)	Alkalinity at $CaCO_3$ (mg/L)	260
DO (mg/L)	.87(2)	Hydrogen Sulfide (mg/L)	0.3
Temp.(°C)	11.9	Sulfate (mg/L)	>200
TDS (g/L)	1.8	CO_2 (mg/L)	138
ORP (mv)	-255		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified
Microbes			
Disolved Metals - total iron (Field filtered, Select wells only)	1-500 ML plstic	Nitric acid	EPA 200.7 or 200.9

(1) LaMott 2020 (2) Suspect

Comments: Duplicate labeled PMW-103D, 1/15/08, 1500

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name Ekonol | Well ID: PMW-4D | Well Diameter: 2 Inches

Samplers: DC Burkert | Monitored Natural Attenuation Sample Set (Y/N)? Y

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Peristaltic Pump Date/Time: 1/16/08 8:00

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
8:10	7.00	200	--	6.72	3.95	395	3.00	8.3	2.0	-137	D.O. Suspect
8:30	7.10	200	6 L	7.44	2.81	281	2.91	10.6	1.9	-295	
8:40	7.11	200	7 L	7.32	2.33	233	2.89	11.3	1.8	-299	
8:45	7.11	200	7.5 L	7.47	2.44	244	2.87	11.4	1.8	-303	
8:50	7.11	200	8 L	7.48	1.61	161	2.86	11.7	1.8	-305	

Sampling Data

Method: Peristaltic Pump Date/Time: 1/1562008 9:00 Total Volume of Water purged: 6 gallon

Field Parameters

HORRIBA		HACH TEST KITS	
pH	7.48	Ferrous Iron (mg/L)	0.6
Spec. Cond.(mS/cm)	2.86	Manganese (mg/L)	0
Turbidity (NTU)	60 (LaMott)	Alkalinity at $CaCO_3$ (mg/L)	300
DO (mg/L)	1.01 (suspect)	Hydrogen Sulfide (mg/L)	0.9
Temp.(°C)	11.7	Sulfate (mg/L)	>200
TDS (g/L)	1.8	CO_2 (mg/L)	200
ORP (mv)	-305		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET

Parameter	Bottle	Pres.	Method
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids	18 bottles		lab specified
Disolved Metals (MNA only)	1-500 ML plstic	HNO_3	EPA 200.7 or 200.9

(1) LaMoHc 2020 (2) Suspect

Comments: Ms/MSD on VOCs, Sample degassing noticed

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name Ekonol | Well ID: PMW-5D | Well Diameter: 2 Inches

Samplers: JWS | Monitored Natural Attenuation Sample Set (Y/N)? Y

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
Static WL 6.85

Method: Peristaltic Pump | Date/Time: 1/15/08 14:15

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
14:25	7.00	600	1.0	7.29	0.93	error	2.46	12.6	1.6	-230	Turned pump down
14:30	--	--	1.5	7.27	0.00	748	2.35	12.3	1.5	-228	
14:35	7.00	300		7.25	0.00	50	2.32	12.7	1.5	-230	Turned pump down
14:50	7.00	600	2.5	7.24	0.00	10	2.26	13.3	1.5	-210	
15:00	7.00	600	4.2	7.25	0.00	--	2.26	13.6	1.5	-201	
15:05	7.00	600	5.5	7.24	0.00	9.31	2.28	13.6	1.5	-203	

Sampling Data

Method: Peristaltic Pump | Date/Time: 1/15/08 15:15 | Total Volume of Water purged: 5 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	7.24	Ferrous Iron (mg/L)	0.9
Spec. Cond.(mS/cm)	2.28	Manganese (mg/L)	0
Turbidity (NTU)	9.31	Alkalinity at $CaCO_3$ (mg/L)	300
DO (mg/L)	0.00	Hydrogen Sulfide (mg/L)	0.1
Temp.(°C)	13.6	Sulfate (mg/L)	>200
TDS (g/L)	1.5	CO_2 (mg/L)	200
ORP (mv)	-203		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids	1-250 Amber	none	lab specified

Comments: Microbe sample had turbidty from tubing sliding down well. Raised tubing and cleared turbidty, continued sampling

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-5D | Well Diameter: 2 Inches

Samplers: JWS | Monitored Natural Attenuation Sample Set (Y/N)? Y

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
Static WL 6.90

Method: Peristaltic Pump | Date/Time: 1/14/08 13:45

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
13:50	7.10	600		6.68	0.21	390	4.18	13.3	3.0	-106	
13:58	7.10	600	2.5	7.14	0.00	83.3	4.22	13.8	2.7	-127	
14:02	7.10	450	3.2	7.17	0.00	87.5	3.73	13.9	2.4	-128	
14:08	7.10	450	5.0	7.20	0.00	113	3.62	14.1	2.3	-129	
14:15	7.05	450		7.24	0.00	38	3.08	13.3	2.0	-130	
14:20	7.05	450	6.0	7.23	0.00	22	3.65	13.2	2.9	-126	

Sampling Data

Method: Peristaltic Pump | Date/Time: 1/14/08 14:15 | Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH	7.23	Ferrous Iron (mg/L)	0.9
Spec. Cond.(mS/cm)	3.65	Manganese (mg/L)	0
Turbidity (NTU)	22	Alkalinity at $CaCO_3$ (mg/L)	280
DO (mg/L)	0.00	Hydrogen Sulfide (mg/L)	0
Temp.(°C)	13.2	Sulfate (mg/L)	>200
TDS (g/L)	2.9	CO_2 (mg/L)	196
ORP (mv)	-126		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids	1-250 Amber	none	lab specified
Metals (MNA only)	1-500 ML plstic	HNO_3	EPA 200.7 or 200.9

Comments:

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name Ekonol | Well ID: PMW-7D | Well Diameter: 2 Inches

Samplers: JWS | Monitored Natural Attenuation Sample Set (Y/N)? Y

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
Static 7.18

Method: Peristaltic Pump | Date/Time: 1/16/08 8:20

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
8:20	7.19	500	0.1	7.01	3.04	485	3.62	12.4	2.3	-148	
8:28	7.19	500	1.3	7.34	0.62	271	3.25	13.4	2.1	-180	
8:35	7.29	500	2.4	7.32	0.03	14	3.20	13.7	2.0	-177	
8:48	7.29	500	5.5	7.27	0.00		3.14	13.9	2.0	-172	
8:59	7.20	300	6.2	7.27	0.00	6.8	3.16	13.4	2.0	-168	

Sampling Data

Method: Peristaltic Pump | Date/Time: 1/16/08 9:15 | Total Volume of Water purged: 6.5 gallons

Field Parameters

HORRIBA	
pH	7.27
Spec. Cond.(mS/cm)	3.13
Turbidity (NTU)	6
DO (mg/L)	0.00
Temp.(°C)	13.5
TDS (g/L)	2.0
ORP (mv)	-169

HACH TEST KITS		
Ferrous Iron (mg/L)	1.0	Duf 1.0
Manganese (mg/L)	0	0
Alkalinity at $CaCO_3$ (mg/L)	320	320
Hydrogen Sulfide (mg/L)	0	0
Sulfate (mg/L)	>200	>200
CO_2 (mg/L)	194	198

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids	1-250 Amber	none	lab specified
Disolved Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	EPA 200.7 or 200.9

Comments: Horriba turbidity error, will use separate meter

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name Ekonol | Well ID: PMW-8D | Well Diameter: 2 Inches

Samplers: DC Burkert | Monitored Natural Attenuation Sample Set (Y/N)? Y

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Peristaltic Pump Date/Time: 1/14/08 13:10

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
13:15	6.48	680		8.81	1.54	NA	5.08	13.6	3.2	-163	
13:22	6.58	680	1.3	8.07	1.07	442	4.42	13.9	2.8	-167	
13:26	6.58	640	2.0	7.83	0.85	354	4.27	13.9	2.7	-162	
13:30	6.58	640		7.73	0.83	162	4.24	13.6	2.7	-161	
13:36	6.56	640	3.0	7.73	0.81	131	4.15	13.5	2.7	-159	
13:39	6.56	640		7.76	0.77	448	4.13	13.4	2.6	-157	
13:42	6.56	640	3.5	7.83	0.72	153	4.11	13.5	2.6	-156	
13:45	6.56	640		7.70	0.72	134	4.05	13.6	2.6	-156	
13:48	6.56	640		7.71	0.72	137	4.04	13.5	2.6	-156	
13:51	6.56	640	4.0	7.73	0.71	139	4.02	13.6	2.6	-155	

Sampling Data

Method: Peristaltic Pump Date/Time: 1/14/08 13:55 Total Volume of Water purged: 4.1 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	7.73(1)	Ferrous Iron (mg/L)	1.0
Spec. Cond.(mS/cm)	4.02	Manganese (mg/L)	0
Turbidity (NTU)	18 (LaMott)	Alkalinity at $CaCO_3$ (mg/L)	320
DO (mg/L)	0.71	Hydrogen Sulfide (mg/L)	0.3
Temp.(°C)	13.6	Sulfate (mg/L)	>200
TDS (g/L)	2.6	CO_2 (mg/L)	265
ORP (mv)	-155		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids	1-250 Amber	none	lab specified
Disolved Metals - total iron (Field filtered, Select wells only)		Nitric acid	EPA 200.7 or 200.9

Comments: (1) error 5 on Horiba, 6.89 using Hanna HI991301

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name Ekonol Well ID: RMW-4D Well Diameter: 2 Inches

Samplers: DC Burkert Monitored Natural Attenuation Sample Set (Y/N)? Y

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Peristaltic Pump Date/Time: 1/15/08 10:50

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
11:20	6.84	240		6.98	1.15	NA	3.16	12.8	2.0	-353	D.O. cal in question
11:40	6.95	240	4.8 L	7.46	1.07	444	3.00	12.7	1.9	-362	
11:50	6.95	240	7.2 L	7.52	1.05	335	2.96	12.1	1.9	-356	
12:00	6.95	240	9.6 L	7.50	1.03	273	2.98	11.8	1.9	-351	
12:05	6.95	240	10.8 L	7.50	0.99	268	2.97	12.0	1.9	-352	
12:10	6.95	240	12 L	7.51	0.98	260	2.98	11.7	1.9	-352	

Sampling Data

Method: Peristaltic Pump Date/Time: 1/15/08 12:15 Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH	7.51	Ferrous Iron (mg/L)	0.2
Spec. Cond.(mS/cm)	2.98	Manganese (mg/L)	0
Turbidity (NTU)	28 NTU(1)	Alkalinity at $CaCO_3$ (mg/L)	320
DO (mg/L)	.98(2)	Hydrogen Sulfide (mg/L)	4.0
Temp.(°C)	11.7	Sulfate (mg/L)	>200
TDS (g/L)	1.9	CO_2 (mg/L)	96
ORP (mv)	-352		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids	1-250 Amber	none	lab specified
Microbes(3)			

Comments: (1) LaMott 2020 (2) suspect (3) 1.0 liters water through filter 1/18/08 Note well had pressure when first opened

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name Ekonol | Well ID: MW-7D | Well Diameter: 4" Inches

Samplers: DC Burkert | Monitored Natural Attenuation Sample Set (Y/N)? N

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Peristaltic Pump Date/Time: 1/15/08 8:00

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
8:25	6.88	2.5		7.03	1.46	39.9	1.88	11.6	1.2	-149	
8:35	6.89	2.5	2.5 L	7.43	1.12	39.1	2.55	11.2	1.7	-196	
8:45	6.89	2.5	5 L	7.48	1.03	9.2	3.03	11.6	1.9	-243	
8:55	6.89	2.5	7.5 L	7.47	0.99	16.6	3.10	11.5	2.0	-257	
9:00	6.89	2.5	8.75	7.51	1.00	17.9	3.13	11.5	2.0	-264	
9:05	6.89	2.5	10.0	7.51	0.98	18.8	3.15	11.7	2.0	-268	
9:10	6.89	2.5	11.25	7.51	1.03	17.8	3.16	11.8	2.0	-281	
9:15	6.89	2.5	12.5	7.51	1.03	17.7	3.15	11.9	2.0	-275	

Sampling Data

Method: Peristaltic Pump Date/Time: 1/15/08 9:20 Total Volume of Water purged: 12.5 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	7.51	Ferrous Iron (mg/L)	0.4
Spec. Cond.(mS/cm)	3.15	Manganese (mg/L)	0
Turbidity (NTU)	17.7	Alkalinity at $CaCO_3$ (mg/L)	360
DO (mg/L)	1.03	Hydrogen Sulfide (mg/L)	0.5
Temp.(°C)	11.9	Sulfate (mg/L)	>200
TDS (g/L)	2.0	CO_2 (mg/L)	140
ORP (mv)	-275		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified
Disolved Metals - total iron (Field filtered, Select wells only)	1-500 ML plstic	Nitric acid	EPA 200.7 or 200.9

Comments: D.O. calibrated ok but I question the accuracy given -275 ORP

PARSONS

Performance Monitoring Event #1

April 2009

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: INJ-01 Well Diameter: 4 Inches

Samplers: JDB Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
7.8

Method: geopump/low-flow Date/Time: 7/24/08 8:17

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
8:17	--	--	--	--	--	start	purge	--	--	--	--
8:23	8.00	170m 4mm	0.5	5.91	0.43	119	4.400	15.40	2.8	-173	clear w/ black particles
8:28	8.00	170m 4mm	6.0	5.98	0.42	114	4.300	15.30	2.7	-180	clear w/ black particles
8:33	8.00	170m 4mm	6.03	6.03	0.36	101	4.200	15.40	2.7	-195	clear w/ black particles
8:38	8.00	170m 4mm	6.1	6.06	0.33	95	4.100	15.20	2.6	-215	clear w/ black particles
8:43	8.00	170m 4mm	6.1	6.07	0.33	104	4.100	15.10	2.6	-228	clear w/ black particles
8:48	8.00	170m 4mm	6.08	6.08	0.33	99	4.100	15.10	2.6	-245	clear w/ black particles
8:53	8.00	170m 4mm	6.1	6.08	0.33	91	100.000	15.10	2.5	-255	clear w/ black particles
8:58	8.00	170m 4mm	6.1	6.09	0.34	91	3.900	15.10	2.5	-265	clear w/ black particles
9:03	--	170m 4mm	2.5	6.09	0.35	99	3.900	15.10	2.5	-273	clear w/ black particles

Sampling Data

Method: geopump/low-flow Date/Time: 7/24/2008 9:43 Total Volume of Water purged: 5.25 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.11	Ferrous Iron (mg/L)	3.2 mg/L
Spec. Cond.(mS/cm)	3.60	Sulfate	>200 mg/L
Turbidity (NTU)	83.00	Manganese	0.20
DO (mg/L)	0.44	CO_2	>1600 (x2 800 multiplier
Temp.(°C)	14.70	Alkalinity	580.00
TDS (g/L)	2.30	Hydrogen Sulfide	1.80
ORP (mv)	-300.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: DNA sample @ 0958

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: INJ-01 cont. Well Diameter: 4 Inches

Samplers: JDB Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: geopump/low-flow Date/Time:

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
9:08	--	170m 4mm	2.75	6.09	0.40	103.80	3.90	15.10	2.50	-274	clear w/ black particles
9:13	--	170m 4mm	3.00	6.11	0.39	95.70	3.90	15.10	2.50	-282	clear w/ black particles
9:18	--	170m 4mm	3.25	6.11	0.41	92.80	3.80	15.10	2.40	-287	clear w/ black particles
9:23	--	170m 4mm	3.50	6.09	0.42	89.30	3.80	15.00	2.40	-292	clear w/ black particles
9:28	--	170m 4mm	3.75	6.10	0.43	83.40	3.70	14.90	2.40	-296	clear w/ black particles
9:33	--	170m 4mm	4.50	6.11	0.44	83.30	3.70	14.70	2.40	297	clear w/ black particles
9:38	--	170m 4mm	5.25	6.11	0.43	82.40	3.60	14.70	2.30	-300	clear w/ black particles
9:43	--	170m 4mm	5.25	6.11	0.44	83.00	3.60	14.70	2.30	-300	clear w/ black particles

Sampling Data

Method: geopump/low-flow Date/Time: Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH		Ferrous Iron (mg/L)	
Spec. Cond.(mS/cm)		Sulfate	
Turbidity (NTU)		Manganese	
DO (mg/L)		CO_2	
Temp.(°C)		Alkalinity	
TDS (g/L)		Hydrogen Sulfide	
ORP (mv)			

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: DNA sample @ 0958

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: INJ-02 Well Diameter: 4 Inches

Samplers: EPS Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
7.84

Method: geopump/low-flow Date/Time: 7/24/08 15:10

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
13:15	--	--	0.40	10.55	0.60	938.00	3.54	15.61	2.30	-169	
13:20	8.49	--	0.70	10.70	0.53	162.00	3.66	15.55	2.30	-176	
13:25	--	--	1.20	10.85	0.46	194.00	3.65	15.63	2.30	-186	
13:30	--	--	1.70	11.02	0.45	434.00	3.62	15.89	2.30	-201	
13:35	--	--	2.10	11.36	0.44	648.00	3.65	15.52	2.30	-220	
13:40	--	--	2.50	11.74	0.45	791.00	3.70	15.54	2.40	-244	
13:45	8.41	--	3.00	11.98	0.44	927.00	3.73	15.57	2.40	-259	
13:50	--	--	3.50	12.11	0.43	988.00	100.00	15.62	2.40	-268	
13:55	--	--	4.00	12.43	0.43	1071.00	3.74	15.71	2.40	-286	
14:00	--	--	4.40	12.51	0.42	1080.00	3.72	15.74	2.40	-294	

Sampling Data

Method: Date/Time: Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.32	Ferrous Iron (mg/L)	4.00
Spec. Cond.(mS/cm)	3.70	Sulfate	>200 mg/L
Turbidity (NTU)	369.00	Manganese	0.00
DO (mg/L)	0.43	CO_2	>1600 (x2 800 multiplier
Temp.(°C)	15.76	Alkalinity	700.00
TDS (g/L)	2.30	Hydrogen Sulfide	2.10
ORP (mv)	-304.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: Purge to stability - only sampling microbes

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: INJ-02 (Cont'd) Well Diameter: 4 Inches

Samplers: EPS Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

Method: geopump/low-flow Date/Time:

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
14:05	--	--	4.80	12.47	0.46	580.00	3.96	15.76	2.50	-292	
14:10	--	--	5.20	12.85	0.49	383.00	3.71	15.73	2.40	-301	
14:15	--	--	5.70	12.51	0.44	378.00	3.70	15.74	2.40	-304	
14:30	--	--	6.20	12.53	0.43	369.00	3.70	15.76	2.50	-304	

Sampling Data

Method: Date/Time: Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH		Ferrous Iron (mg/L)	
Spec. Cond.(mS/cm)		Sulfate	
Turbidity (NTU)		Manganese	
DO (mg/L)		CO_2	
Temp.(°C)		Alkalinity	
TDS (g/L)		Hydrogen Sulfide	
ORP (mv)			

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: Purge to stability - only sampling microbes

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: PMW-1D Well Diameter: 4 Inches

Samplers: EPS Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
WL = 6.7

Method: geopump/low-flow Date/Time: 7/25/08 8:30

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
8:35	--	--	0.30	10.75	0.41	111.00	5.72	17.55	3.60	-180	
9:00	--	--	0.60	11.14	0.34	50.00	8.77	18.50	3.60	-208	
9:05	--	--	0.90	11.24	0.38	41.80	5.72	19.00	3.60	-216	
9:10	6.95	--	1.10	11.58	0.28	18.30	5.72	18.40	3.60	-237	
9:15	--	--	1.30	11.61	0.30	24.70	5.70	19.60	3.60	-242	
9:20	--	--	1.50	11.88	0.25	17.90	5.84	17.59	3.70	-256	
9:25	--	--	1.70	12.11	0.25	13.40	5.62	19.06	3.50	-273	
9:35	--	--	2.00	12.21	0.76	17.60	100.00	16.63	3.70	-288	Battery dead on pump
9:45	--	--	2.50	13.28	0.40	18.00	3.61	16.15	3.50	-341	
9:50	7.00	--	3.10	13.55	0.40	11.60	5.58	16.26	3.50	-356	

Sampling Data

Method: geopump/low-flow Date/Time: 7/25/08 10:05 Total Volume of Water purged: 4.5 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.27	Ferrous Iron (mg/L)	3.2 mg/L
Spec. Cond.(mS/cm)	5.42	Sulfate	>200 mg/L
Turbidity (NTU)	8.20	Manganese	0.10
DO (mg/L)	0.42	CO_2	could not get a reading
Temp.(°C)	16.26	Alkalinity	560.00
TDS (g/L)	3.40	Hydrogen Sulfide	0.40
ORP (mv)	-368.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: pH reading very hight, checked reading with second Horiba. pH reading w/ second Horiba was 6.32

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: PMW-1D (Cont'd) Well Diameter: 4 Inches

Samplers: EPS Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: geopump/low-flow Date/Time:

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
9:55	--	--	3.50	13.72	0.40	8.90	5.43	16.15	3.40	-367	
10:00	--	--	3.80	13.83	0.41	8.80	5.42	16.14	3.40	-367	
10:05	--	--	4.50	13.84	0.42	8.20	5.42	16.26	3.40	-368	

Sampling Data

Method: geopump/low-flow Date/Time: Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH		Ferrous Iron (mg/L)	
Spec. Cond.(mS/cm)		Sulfate	
Turbidity (NTU)		Manganese	
DO (mg/L)		CO_2	
Temp.(°C)		Alkalinity	
TDS (g/L)		Hydrogen Sulfide	
ORP (mv)			

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: pH reading very hight, checked reading with second Horiba. pH reading w/ second Horiba was 6.32

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-2D | Well Diameter: 2 Inches

Samplers: EPS | Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
7.35

Method: Geopump/low flow | Date/Time: 7/23/08 9:25

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
9:30	--	--	0.50	10.68	0.62	>1000	4.59	16.58	2.90	-202	
9:35	8.06	--	1.00	11.00	0.68	>1000	4.45	16.34	2.80	-224	
9:40	--	--	1.50	11.37	0.58	>1000	4.35	16.38	2.80	-245	
9:45	--	--	2.00	11.46	0.56	>1000	4.35	16.48	2.80	-253	
9:50	--	--	2.50	11.66	0.56	>1000	4.31	16.10	2.80	-260	
9:55	7.95	--	3.00	11.69	0.55	>1000	4.29	16.07	2.70	-262	
10:00	7.95	--	3.50	11.90	0.53	>1000	4.24	16.23	2.70	-297	
10:05	7.95	--	4.00	11.91	0.53	>1000	100.00	16.48	2.70	-297	
10:10	7.95	--	4.50	12.03	0.53	>1000	4.12	16.51	2.70	-284	
10:15	7.96	--	5.00	12.13	0.52	>1000	4.05	16.64	2.60	-291	cloudy

Sampling Data

Method: Geopump/low flow | Date/Time: 7/23/08 10:25 | Total Volume of Water purged: 6 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.40	Ferrous Iron (mg/L)	3.00
Spec. Cond.(mS/cm)	4.07	Sulfate	200.00
Turbidity (NTU)	>1000	Manganese	0.00
DO (mg/L)	0.52	CO_2	1672.00
Temp.(°C)	16.51	Alkalinity	520.00
TDS (g/L)	2.60	Hydrogen Sulfide	2.00
ORP (mv)	-294.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: pH reading very hight, checked reading with second Horiba. pH reading w/ second Horiba was 6.32

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: PMW-2D (Cont'd) Well Diameter: 2 Inches

Samplers: EPS Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Geopump/low flow Date/Time:

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
10:20	7.96	--	5.50	12.14	0.52	>1000	4.06	16.42	2.60	-292	cloudy
10:25	7.96	--	6.00	12.18	0.52	>1000	4.07	16.51	2.60	-294	cloudy

Sampling Data

Method: Geopump/low flow Date/Time: Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH		Ferrous Iron (mg/L)	
Spec. Cond.(mS/cm)		Sulfate	
Turbidity (NTU)		Manganese	
DO (mg/L)		CO_2	
Temp.(°C)		Alkalinity	
TDS (g/L)		Hydrogen Sulfide	
ORP (mv)			

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: pH reading very hight, checked reading with second Horiba. pH reading w/ second Horiba was 6.32

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: PMW-3D Well Diameter: 2 Inches

Samplers: EPS Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
WL = 9'

Method: geopump/low-flow Date/Time: 7/22/08 14:50

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
14:55	9.00		0.25	11.21	0.00	>1000	3.37	16.61	2.10	-302	
15:00	9.00		0.50	11.30	0.38	>1000	3.32	16.40	2.10	-310	
15:05	9.00		1.00	11.23	0.38	>1000	3.34	16.47	2.10	-311	
15:10	9.44		1.25	11.23	0.46	>1000	3.33	16.33	2.10	-312	
15:15			1.75	11.27	0.38	>1000	3.34	16.31	2.10	-312	
15:20			2.25	11.22	0.39	>1000	3.36	16.81	2.20	-311	
15:25			3.00	11.21	0.35	>1000	3.35	16.59	2.20	-309	
15:30	9.14		3.50	11.18	0.36	>1000	100.00	16.81	2.10	-308	
15:35			4.50	11.21	0.35	>1000	3.35	16.80	2.10	-309	

Sampling Data

Method: geopump/low-flow Date/Time: 7/22/08 15:35 Total Volume of Water purged: 4.5 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.46	Ferrous Iron (mg/L)	1.00
Spec. Cond.(mS/cm)	3.35	Sulfate	>200
Turbidity (NTU)	>1000	Manganese	0.00
DO (mg/L)	0.35	CO_2	1508 mg/L
Temp.(°C)	16.80	Alkalinity	460.00
TDS (g/L)	2.10	Hydrogen Sulfide	(1xmultiplier 2.2)
ORP (mv)	-309.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: pH reading very hight, checked reading with second Horiba. pH reading w/ second Horiba was 6.32

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: PMW-4D Well Diameter: 2 Inches

Samplers: JDB Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
7.9

Method: geopump/low-flow Date/Time: 7/22/08 14:50

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
14:50	--	--	--	--	--	start	purge	--	--	--	--
14:55	8.15	70 ml/min	0.25	6.54	0.48	109.30	3.20	17.40	2.00	-325	p. cloudy
15:00	8.20	70 ml/min	0.50	6.55	0.49	126.00	3.30	17.90	2.10	-325	p. cloudy
15:05	8.20	70 ml/min	0.75	6.51	0.49	144.00	3.50	18.10	2.20	-326	p. cloudy
15:10	8.20	70 ml/min	1.00	6.49	0.39	200.00	3.60	17.90	2.40	-330	p. cloudy
15:15	8.20	70 ml/min	1.25	6.47	0.37	235.00	3.80	17.60	2.50	-332	p. cloudy
15:20	8.20	70 ml/min	1.75	6.46	0.36	273.00	3.90	17.80	2.50	-333	p. cloudy
15:25	8.20	70 ml/min	2.00	6.44	0.36	251.00	100.00	17.60	2.50	-332	p. cloudy
15:30	8.20	70 ml/min	2.25	6.43	0.36	244.00	4.00	17.40	2.50	-332	p. cloudy

Sampling Data

Method: geopump/low-flow Date/Time: 7/22/08 15:50 Total Volume of Water purged: 3.6 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.40	Ferrous Iron (mg/L)	1.3 mg/L
Spec. Cond.(mS/cm)	4.00	Sulfate	>200 mg/L
Turbidity (NTU)	251.00	Manganese	0.10
DO (mg/L)	0.39	CO_2	900 mg/L (1xmultiplier)
Temp.(°C)	16.30	Alkalinity	540.00
TDS (g/L)	2.60	Hydrogen Sulfide	2.00
ORP (mv)	-331.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments:

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: PMW-4D (Cont'd) Well Diameter: 2 Inches

Samplers: JDB Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

Method: geopump/low-flow Date/Time:

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
15:30	8.20	70 mL/min	2.50	6.43	0.42	252.00	4.00	17.40	2.60	-330	p. cloudy
15:35	8.20	70 mL/min	2.75	6.41	0.39	249.00	4.00	15.90	2.60	-329	p. cloudy
15:40	8.20	70 mL/min	3.00	6.41	0.38	2252.00	4.00	16.40	2.60	-329	p. cloudy
15:45	8.25	70 mL/min	3.25	6.41	0.38	253.00	4.10	16.10	2.60	-330	p. cloudy
15:50	8.25	70 mL/min	3.60	6.40	0.39	251.00	4.00	16.30	2.60	-331	p. cloudy

Sampling Data

Method: geopump/low-flow Date/Time: Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH		Ferrous Iron (mg/L)	
Spec. Cond.(mS/cm)		Sulfate	
Turbidity (NTU)		Manganese	
DO (mg/L)		CO_2	
Temp.(°C)		Alkalinity	
TDS (g/L)		Hydrogen Sulfide	
ORP (mv)			

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments:

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-5D | Well Diameter: 2 Inches

Samplers: EPS | Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
7.02

Method: geopump/low flow Date/Time: 7/22/08 10:20

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
10:25	7.02	--	0.00	10.50	3.66	>1000	3.31	18.04	1.90	-206	pH very high
10:30	--	--	0.75	10.85	1.92	>1000	3.11	16.39	1.90	-230	
10:45	8.40	--	1.25	10.83	0.91	>1000	2.98	16.26	1.90	-247	
10:50	--	--	1.75	11.14	0.59	>1000	3.04	15.59	1.90	-266	pH increasing!
10:55	8.40	--	2.25	11.28	0.46	>1000	2.93	15.50	1.90	-275	
11:00	--	--	2.75	11.42	0.47	959	2.93	15.49	1.90	-280	
11:05	8.40	--	3.50	11.50	0.44	>1000	2.93	15.51	1.90	-283	
11:10	--	--	4.00	11.59	0.42	>1000	100.00	15.60	1.90	-289	
11:15	--	--	4.75	11.67	0.44		2.99	15.58	1.90	-294	
11:20	--	--	5.25	11.72	0.42	834	2.98	15.68	1.90	-297	
11:25	--	--	6.00	11.75	0.43	842	2.99	15.44	1.90	-298	

Sampling Data

Method: geopump/low flow Date/Time: 7/22/08 11:25 Total Volume of Water purged: 6 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.68	Ferrous Iron (mg/L)	1.8 mg/L
Spec. Cond.(mS/cm)	2.99	Sulfate	>200
Turbidity (NTU)	842.00	Manganese	0.00
DO (mg/L)	0.43	CO_2	598.00
Temp.(°C)	15.44	Alkalinity	460 g/8
TDS (g/L)	1.90	Hydrogen Sulfide	2.00
ORP (mv)	-298.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET

Parameter	Bottle	Pres.	Method
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	1-100mL, glass	HCL	SW9060
Metals	1-500 mL plastic	Nitric acid	lab specified
Chloride	1-250mL, plastic	none	lab specified
Nitrate/Nitrite	1-250mL, plastic	Sulfuric acid	lab specified
Sulfate	1-250mL, plastic	none	lab specified

Comments: Stopped pumping to change tubing - cracked & drwaing air

pH w/ second Horiba was 6.68

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-6D | Well Diameter: 2 Inches

Samplers: JDB | Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
7.84

Method: geopump/low-flow Date/Time: 7/22/08 10:13

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
10:13	--	--	--	start	pump	--	--	--	--	--	--
10:18	7.80	70 ml/min	0.25	5.96	2.38	>1000	4.70	16.70	3.00	-265	
10:23	7.90	70 ml/min	0.50	6.07	2.40	>1000	4.50	16.20	2.90	-301	
10:28	7.95	70 ml/min	0.75	6.14	1.71	>1000	4.40	16.00	2.80	-311	
10:33	8.05	70 ml/min	1.25	6.20	1.24	>1000	4.40	15.90	2.80	-319	slowed down pump
10:38	8.05	70 ml/min	1.50	6.21	1.13	>1000	4.30	16.30	2.70	-320	
10:43	8.05	70 ml/min	1.80	6.24	1.03	>1000	4.20	16.60	2.70	-323	
10:48	8.05	70 ml/min	2.25	6.24	0.98	>1000	100.00	16.80	2.70	-323	slowed down pump
10:53	8.05	70 ml/min	2.50	6.26	0.85	>1000	4.20	17.30	2.70	-326	
10:58	8.05	--	2.75	6.27	0.84	>1000	4.20	17.10	2.70	-325	
11:03	8.05	--	3.00	6.24	0.84	>1000	4.20	17.10	2.70	-322	

Sampling Data

Method: geopump/low-flow Date/Time: 7/22/08 11:10 Total Volume of Water purged: 3 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.24	Ferrous Iron (mg/L)	4.0 mg/L
Spec. Cond.(mS/cm)	4.20	Sulfate	>200
Turbidity (NTU)	>1000	Manganese	0.1 mg/L
DO (mg/L)	0.84	CO_2	1749 mg/L
Temp.(°C)	17.10	Alkalinity	600 g/g
TDS (g/L)	2.70	Hydrogen Sulfide	2.00
ORP (mv)	-322.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET

Parameter	Bottle	Pres.	Method
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	1-100mL, glass	HCL	SW9060
Metals	1-500 mL plastic	Nitric acid	lab specified
Chloride	1-250mL, plastic	none	lab specified
Nitrate/Nitrite	1-250mL, plastic	Sulfuric acid	lab specified
Sulfate	1-250mL, plastic	none	lab specified

VFA

Comments:

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-7D | Well Diameter: 2 Inches

Samplers: JDB | Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
6.6

Method: geopump/low-flow | Date/Time: 7/24/08 13:00

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
12:57	--	--	--	start	purge	--	--	--	--	--	--
13:03	--	--	gallons before rea			--	--	--	--	--	--
13:22	6.80	170 mL/min	3.00	6.11	0.26	989.00	3.80	14.90	2.40	-230	cloudy/gray
13:27	6.80	--	3.50	6.30	0.28	933.00	3.80	15.70	2.40	-277	cloudy/gray
13:32	6.80	--	4.00	6.33	0.28	903.00	3.80	15.50	2.40	-313	cloudy/gray
13:37	6.80	--	4.50	6.34	0.28	850.00	3.80	15.60	2.40	-316	cloudy/gray
13:42	6.80	--	5.00	6.33	0.31	832.00	3.80	15.50	2.40	-323	cloudy/gray
13:47	6.80	--	5.50	6.34	0.35	762.00	100.00	15.80	2.40	-325	cloudy/gray
13:52	6.80	--	6.00	6.33	0.37	757.00	3.80	15.80	2.50	-326	cloudy/gray
13:57	6.80	170 mL/min	7.00	6.33	0.38	749.00	3.80	15.70	2.50	-326	cloudy/gray

Sampling Data

Method: geopump/low-flow | Date/Time: 7/24/08 14:07 | Total Volume of Water purged: 8

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.34	Ferrous Iron (mg/L)	1.0 mg/L
Spec. Cond.(mS/cm)	3.80	Sulfate	>200 mg/L
Turbidity (NTU)	16.00	Manganese	0.20
DO (mg/L)	0.44	CO_2	1200.00
Temp.(°C)	16.00	Alkalinity	62.00
TDS (g/L)	2.50	Hydrogen Sulfide	1.80
ORP (mv)	-327.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET

Parameter	Bottle	Pres.	Method
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: Duplicate PMW-70D @ 1428

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: PMW-7D (Cont'd) Well Diameter: 2 Inches

Samplers: JDB Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

Method: geopump/low-flow Date/Time:

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
14:02	6.80	--	7.50	6.33	0.42	722.00	3.80	15.70	2.40	-326	cloudy/gray
14:07	6.80	--	8.00	6.34	0.44	701.00	3.80	16.00	2.50	-327	cloudy/gray

Sampling Data

Method: geopump/low-flow Date/Time: Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH		Ferrous Iron (mg/L)	
Spec. Cond.(mS/cm)		Sulfate	
Turbidity (NTU)		Manganese	
DO (mg/L)		CO_2	
Temp.(°C)		Alkalinity	
TDS (g/L)		Hydrogen Sulfide	
ORP (mv)			

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: Duplicate PMW-70D @ 1428

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: PMW-8D Well Diameter: 2 Inches

Samplers: JDB Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
6.9

Method: geopump/low-flow Date/Time: 7/23/08 9:08

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
9:08	--	--	--	start	purge	--	--	--	--	--	--
9:13	7.20	70 mL/min	0.50	6.13	0.49	>1000	5.20	16.20	3.30	-283	white/cloudy
9:18	7.20	70 mL/min	0.75	6.33	0.40	>1000	5.20	15.90	3.30	-312	white/cloudy
9:23	7.20	70 mL/min	1.00	6.42	0.33	>1000	4.90	16.00	3.20	-321	p. white/cloudy
9:28	7.20	70 mL/min	1.25	6.42	0.31	>1000	4.80	16.00	3.10	-323	p. cloudy
9:33	7.25	70 mL/min	1.50	6.43	0.29	617.00	4.80	16.00	3.10	-324	p. cloudy
9:38	7.25	70 mL/min	2.00	6.42	0.28	735.00	4.60	16.00	3.00	-324	p. cloudy
9:43	7.25	70 mL/min	2.25	6.41	0.26	604.00	100.00	16.00	2.90	-324	p. cloudy
9:48	7.25	70 mL/min	2.50	6.39	0.26	666.00	4.50	16.10	2.90	-324	p. cloudy
9:53	7.25	100 mL/min	2.75	6.34	0.26	734.00	4.40	16.20	2.80	-323	p. cloudy

Sampling Data

Method: geopump/low-flow Date/Time: 7/23/08 10:28 Total Volume of Water purged: 7

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.30	Ferrous Iron (mg/L)	1.6 mg/L
Spec. Cond.(mS/cm)	4.10	Sulfate	>200 mg/L
Turbidity (NTU)	>1000	Manganese	0.00
DO (mg/L)	0.29	CO_2	559x2 multiplier = 1114 mg/L
Temp.(°C)	16.20	Alkalinity	540.00
TDS (g/L)	2.60	Hydrogen Sulfide	1.5 mg/L
ORP (mv)	-327.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: PMW-8D MS/MSD also taken for VOCs only

*VOC samples effervesing

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: PMW-8D (Cont'd) Well Diameter: 2 Inches

Samplers: JDB Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: geopump/low-flow Date/Time:

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
9:58	7.25	100 mL/min	3.00	6.32	0.26	1079.00	4.30	16.10	2.70	-324	p. cloudy
10:03	7.25	100 mL/min	3.50	6.31	0.25	>1000	4.30	16.00	2.80	-324	cloudy
10:08	7.25	100 mL/min	4.00	6.30	0.26	>1000	4.30	16.10	2.70	-324	cloudy
10:13	7.25	100 mL/min	4.50	6.29	0.27	>1000	4.20	16.20	2.70	-325	cloudy
10:18	7.25	100 mL/min	5.00	6.28	0.28	>1000	4.20	16.30	2.70	-236	cloudy
10:23	7.25	100 mL/min	5.50	6.34	0.30	>1000	4.10	16.20	2.60	-327	cloudy
10:28	7.25	100 mL/min	6.00	6.30	0.29	>1000	4.10	16.20	2.60	-327	cloudy

Sampling Data

Method: geopump/low-flow Date/Time: Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH		Ferrous Iron (mg/L)	
Spec. Cond.(mS/cm)		Sulfate	
Turbidity (NTU)		Manganese	
DO (mg/L)		CO_2	
Temp.(°C)		Alkalinity	
TDS (g/L)		Hydrogen Sulfide	
ORP (mv)			

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: PMW-8D MS/MSD also taken for VOCs only

*VOC samples effervesing

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: RMW-4D | Well Diameter: 2 Inches

Samplers: EPS | Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
WL = 7.4

Method: geopump/low-flow Date/Time: 7/24/08 8:20

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
8:25			0.50	10.52	0.73	>1000	2.51	14.85	1.70	-171	
8:30			1.25	11.43	0.50	>1000	3.68	16.07	2.40	-221	Turned pump down
8:35	8.12		1.70	11.74	0.50	>1000	3.73	16.03	2.40	-242	
8:40			2.10	11.97	0.45	975.00	3.69	16.07	2.40	-255	
8:45			2.40	12.14	0.46	847.00	3.67	16.01	2.30	-266	
8:50			2.70	12.21	0.48	780.00	3.66	16.04	2.40	-270	
8:55	8.02		3.00	12.30	0.47	660.00	3.66	16.02	2.40	-276	
9:00			3.30	12.89	0.48	784.00	100.00	15.98	2.30	-282	
9:05	8.12		3.70	12.45	0.48	692.00	3.65	16.03	2.30	-286	
9:10			4.00	12.51	0.49	658.00	3.65	15.97	2.30	-290	

Sampling Data

Method: geopump/low-flow Date/Time: 7/24/08 9:30 Total Volume of Water purged: 5.4 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.48	Ferrous Iron (mg/L)	1.20
Spec. Cond.(mS/cm)	3.65	Sulfate	>200
Turbidity (NTU)	348.00	Manganese	0.15
DO (mg/L)	0.48	CO_2	450x2=900
Temp.(°C)	15.98	Alkalinity	29x2=580
TDS (g/L)	2.30	Hydrogen Sulfide	2.20
ORP (mv)	-297.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: PMW-8D MS/MSD also taken for VOCs only

*VOC samples effervesing

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: RMW-4D (Cont'd) Well Diameter: 2 Inches

Samplers: EPS Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: geopump/low-flow Date/Time:

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
9:15			4.30	12.53	0.49	598.00	3.65	16.64	2.30	-293	
9:20			4.60	12.59	0.50	558.00	3.65	16.04	2.30	-295	
9:25			5.00	12.60	0.48	556.00	3.64	15.95	2.30	-296	
9:30			5.40	12.61	0.47	548.00	3.65	15.98	2.30	-297	

Sampling Data

Method: Date/Time: Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH		Ferrous Iron (mg/L)	
Spec. Cond.(mS/cm)		Sulfate	
Turbidity (NTU)		Manganese	
DO (mg/L)		CO_2	
Temp.(°C)		Alkalinity	
TDS (g/L)		Hydrogen Sulfide	
ORP (mv)			

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: PMW-8D MS/MSD also taken for VOCs only

*VOC samples effervesing

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: MW-7D Well Diameter: 4 Inches

Samplers: JDB Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
8.45

Method: geopump/low-flow Date/Time: 7/25/08 8:50

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
8:50	--	--	--	start	purge	--	--	--	--	--	
8:55	8.50	--	1.00	5.44	0.44	>1000	4.10	14.70	2.60	-176	
9:00	8.50	--	2.00	5.68	0.57	>1000	4.00	15.00	2.60	-167	Slowed down pump
9:05	8.50	--	2.50	5.76	0.78	>1000	4.00	16.10	2.60	-192	
9:10	8.50	--	2.50	5.81	0.95	>1000	4.00	16.40	2.60	-240	
9:15	8.50	--	2.45	5.82	1.01	973.00	4.20	16.60	2.70	-297	
9:20	8.50	--	3.00	5.88	1.00	500.00	4.00	16.50	2.60	-339	
9:25	8.50	--	3.25	5.90	0.98	470.00	100.00	16.60	2.60	-343	
9:30	8.50	--	3.50	5.90	0.91	430.00	4.00	16.60	2.60	-363	

Sampling Data

Method: geopump/low-flow Date/Time: 7/25/08 10:25 Total Volume of Water purged: 3.5 gallons

Field Parameters

HORRIBA		HACH TEST KITS	
pH	5.90	Ferrous Iron (mg/L)	0.10
Spec. Cond.(mS/cm)	4.00	Sulfate	>200 mg/L
Turbidity (NTU)	207.00	Manganese	over detection limits
DO (mg/L)	0.48	CO_2	could not get a reading
Temp.(°C)	17.10	Alkalinity	could not get a reading
TDS (g/L)	2.60	Hydrogen Sulfide	0.80
ORP (mv)	-388.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET

Parameter	Bottle	Pres.	Method
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: PMW-8D MS/MSD also taken for VOCs only

*VOC samples effervesing

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: MW-7D (Cont'd) | Well Diameter: 4 Inches

Samplers: JDB | Monitored Natural Attenuation Sample Set (Y/N)?

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Persitaltic Pump Date/Time:

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
9:35	8.50		4.00	5.91	0.86	326.00	4.00	16.70	2.50	-369	
9:40	8.50		4.50	5.91	0.81	364.00	4.00	16.80	2.60	-368	
9:45	8.50		4.75	5.92	0.75	330.00	4.00	16.80	2.50	-368	
9:50	8.50		5.00	5.92	0.70	301.00	3.90	16.90	2.50	-371	
9:55	8.50		5.25	5.92	0.65	360.00	4.00	17.10	2.50	-373	
10:00	8.50		5.50	5.91	0.60	287.00	4.00	17.00	2.50	-385	
10:05	8.50		5.75	5.90	0.55	210.00	3.90	16.90	2.50	-387	
10:10	8.50		6.00	5.90	0.50	208.00	100.00	16.90	2.50	-390	
10:15	8.50		6.50	5.90	0.49	209.00	4.00	17.10	2.50	-389	
10:20	8.50		6.75	5.90	0.48	207.00	4.00	17.10	2.60	-388	

Sampling Data

Method: Date/Time: Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH		Ferrous Iron (mg/L)	
Spec. Cond.(mS/cm)		Sulfate	
Turbidity (NTU)		Manganese	
DO (mg/L)		CO_2	
Temp.(°C)		Alkalinity	
TDS (g/L)		Hydrogen Sulfide	
ORP (mv)			

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
Note: MEE only at select number of wells, see sampling matrix			

Comments: Samples effervesing w/ acid

PARSONS

Performance Monitoring Event #2

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: TS-INJ-1 Well Diameter: 4 Inches

Samplers: D.C. Burkert/C.A. Huey Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
26 - 8.5 = 17.5 x 0.60 = 11.55

Method: Peristaltic Date/Time: 9/30/08 9:35

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
9:37	*	360	--	5.89	0.55	120	5.59	15.17	3.5	-370	initial
10:15	*	360	2.0	5.93	0.00	190	5.50	15.25	3.5	-374	
10:25	*	360	3.0	5.94	0.00	160	5.44	15.13	3.4	-374	
10:30	*	360	3.25	5.94	0.00	160	5.41	15.14	3.4	-373	
10:35	*	360	4.0	5.93	0.00	160	5.42	15.13	3.4	-373	

Sampling Data

Method: Peristalitc Date/Time: 9/30/2008 10:40 Total Volume of Water purged: 5

Field Parameters

HORRIBA		HACH TEST KITS	
pH	5.94	Ferrous Iron (mg/L)	0
Spec. Cond.(mS/cm)	5.41	Sulfate	>200[1]
Turbidity (NTU)	160	Manganese	Rust color >3.0
DO (mg/L)	0	CO_2	5500 [2]
Temp.(°C)	15.13	Alkalinity	480
TDS (g/L)	3.4	Hydrogen Sulfide	5
ORP (mv)	-373		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: * Not able to detect water level. (1) Sulfate: read 125 before test, >200 after reagent added. (2) CO_2 color turned grey not pink.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-1D | Well Diameter: 4 Inches

Samplers: C. Huey, C. Burkett | Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
26 - 8.64 x 0.66 = 11.5 gal

Method: GeoPump Date/Time: 10/1/08 8:43

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
9:05	9.48	320	--	7.22	0.00	33	5.26	14.93	3.3	-317	
9:10	9.21	320	4.9	6.89	0.00	37	5.26	14.91	3.3	-330	
9:15	9.06	320	5.3	6.92	0.00	37	5.32	14.89	3.4	-344	
9:20	9.08	320	5.7	7.28	0.00	50	5.34	14.88	3.4	-381	
9:30	9.08	320	6.5	8.19	0.00	850	5.29	14.90	3.3	-398	
9:45	9.08	320	7.75	6.77	0.00	95	5.26	14.91	3.3	-358	
9:55	9.02	320	8.6	6.78	0.00	31	5.24	14.94	3.3	-360	
10:00	9.06	320	9.1	6.80	0.00	32	5.21	14.87	3.3	-360	
10:05	--	320	9.6	6.80	0.00	30	5.22	14.91	3.2	-357	

Sampling Data

Method: GeoPump Date/Time: 10/1/2008 10:10 Total Volume of Water purged: 12

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.80	Ferrous Iron (mg/L)	0
Spec. Cond.(mS/cm)	5.20	Sulfate	>200
Turbidity (NTU)	30	Manganese	0.1
DO (mg/L)	0	CO_2	806
Temp.(°C)	14.91	Alkalinity	390
TDS (g/L)	3.2	Hydrogen Sulfide	5
ORP (mv)	-355		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Flow started @ 500 ml/min. Slowed to 320 @ 0903

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-2D | Well Diameter: 2 Inches

Samplers: D.C. Burkert/C.A. Huey | Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
26 - 8.5 = 17.5 x 0.16 = 2.8 gal

Method: Peristaltic | Date/Time: 9/29/08 14:40

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
14:40	*	480	--	5.47	0.27	NA	4.63	15.33	2.3	-322	start
14:50	*	480	1.0	5.53	0.19	NA	4.62	15.21	2.9	-337	milky water
15:00	*	480	2.5	5.65	0.00	NA	4.57	15.10	2.9	-346	milky
15:05	*	480	3.0	5.69	0.00	NA	4.56	15.07	2.9	-346	
15:10	*	480	3.5	5.73	0.00	NA	4.57	15.00	2.9	-347	milky
	--										

Sampling Data

Method: Peristaltic | Date/Time: 9/29/2008 15:15 PM | Total Volume of Water purged: 5

Field Parameters

HORRIBA		HACH TEST KITS	
pH	5.72	Ferrous Iron (mg/L)	1
Spec. Cond.(mS/cm)	4.57	Sulfate	Too turbid
Turbidity (NTU)	milky > range	Manganese	NA - Turned orange >3.0
DO (mg/L)	0	CO_2	766
Temp.(°C)	15.02	Alkalinity	480
TDS (g/L)	2.9	Hydrogen Sulfide	5
ORP (mv)	-347		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: * DTW: WLI and IP could not detect top of fluid, interface measurement inconsistent. Purge water too milky for turbidity reading. Mn^+ solution turned wrong color (orange not pink)

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: *Ekonol* Well ID: PMW-3D Well Diameter: 2 Inches

Samplers: C. Huey Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
26 - 8.5 x 0.16 = 2.8 gal

Method: GeoPump Date/Time: 10/29/08 9:55

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
10:15	*	300	1.75	6.25	0.00	400	3.16	15.12	2.0	-345	cloudy
10:20	*	300	2.2	6.25	0.00	851	3.12	15.15	2.0	-346	
10:25	*	300	2.6	6.26	0.00	760	3.15	15.10	2.0	-343	
10:30	*	300	3.0	6.25	0.00	720	3.13	15.02	2.0	-347	
10:35	*	300	3.4	6.25	0.00	700	3.14	15.03	2.0	-350	
10:40	*	300	3.6	6.25	0.00	>1100	3.13	15.02	2.0	-351	very turbid
10:45	*	250	4.0	6.26	0.00	900	3.09	15.18	2.0	-352	
10:50	*	250	4.3	6.29	0.00	>1100	3.07	15.20	2.0	-355	
10:55	*	250	4.6	6.31	0.00	>1100	3.05	15.21	2.0	-356	

Sampling Data

Method: GeoPump Date/Time: 9/30/2008 11:00 Total Volume of Water purged: 5.5

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.32	Ferrous Iron (mg/L)	0
Spec. Cond.(mS/cm)	3.04	Sulfate	Could not run >200 before test
Turbidity (NTU)	>1100	Manganese	rust color >3.0
DO (mg/L)	0	CO_2	6000 turns grey
Temp.(°C)	15.22	Alkalinity	480
TDS (g/L)	1.9	Hydrogen Sulfide	5
ORP (mv)	-356		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Collected duplicate sample PMW-103D (same parameters) @ 1120. * Substrate material in well - erratic water level readings.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: *Ekonol* Well ID: PMW-4D Well Diameter: 2 Inches

Samplers: C. Huey Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
30 - 8.5 x 0.16 = 3.4 gal

Method: GeoPump Date/Time: 9/30/08 13:15

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
13:36	*	300	3.50	6.33	0.00	700	4.58	14.61	2.9	-374	turbid
13:41	*	300	3.9	6.34	0.00	650	4.65	14.90	3.0	-375	cloudy grey
13:46	*	300	4.3	6.36	0.00	750	5.13	14.95	3.2	-376	
13:51	*	300	4.7	6.37	0.00	756	5.16	14.97	3.3	-378	
13:56	*	300	5.1	6.33	0.00	750	5.11	15.07	3.2	-382	

Sampling Data

Method: GeoPump Date/Time: 9/30/2008 14:00 PM Total Volume of Water purged: 7.5

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.32	Ferrous Iron (mg/L)	0
Spec. Cond.(mS/cm)	5.11	Sulfate	>200
Turbidity (NTU)	751	Manganese	0.8
DO (mg/L)	0	CO_2	1298
Temp.(°C)	15.04	Alkalinity	650
TDS (g/L)	3.2	Hydrogen Sulfide	5
ORP (mv)	-383		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: * No water level - erratic readings due to substrate material from injections.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: *Ekonol* Well ID: PMW-5D Well Diameter: 2 Inches

Samplers: C. Huey Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
26 - 8.5 x 0.16 = 2.8 gal

Method: GeoPump Date/Time: 9/29/08 14:35

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
14:48	*	400	1.1	6.01	0.00	60	3.53	14.87	2.3	-363	slightly cloudy
14:53	*	400	1.6	5.98	0.00	40	3.83	14.81	2.5	-368	clearer
14:58	*	400	2.0	5.95	0.00	38	4.02	14.75	2.6	-369	
15:03	*	400	2.5	5.93	0.00	38	4.12	14.69	2.6	-370	
15:08	*	300	2.9	5.91	0.00	38	4.11	14.72	2.6	-371	

Sampling Data

Method: GeoPump Date/Time: 9/29/2008 15:11 Total Volume of Water purged: 3

Field Parameters

HORRIBA		HACH TEST KITS	
pH	5.90	Ferrous Iron (mg/L)	0
Spec. Cond.(mS/cm)	4.11	Sulfate	>200
Turbidity (NTU)	38	Manganese	Unreadable 2.5-3.0 orange color
DO (mg/L)	0	CO_2	672
Temp.(°C)	14.70	Alkalinity	480
TDS (g/L)	2.7	Hydrogen Sulfide	5
ORP (mv)	-371		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: * Substrate material in wells causing irratic water level readings, discontinued water levels.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: *Ekonol* Well ID: PMW-8D Well Diameter: 2 Inches

Samplers: C. Huey Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
26 - 8.5 x 0.16 = 2.8 gal

Method: GeoPump Date/Time: 9/30/08 7:50

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
8:11	--	360	1.00	5.65	0.00	>1100	3.30	14.64	2.1	-264	turbid
8:22	*	360	1.60	5.70	0.00	>1100	3.39	14.67	2.2	-282	
8:27	*	290	2.0	5.75	0.00	>1100	3.69	14.91	2.3	-294	
8:32	*	290	2.3	5.79	0.00	>1100	4.01	14.93	2.5	-306	
8:37	*	290	2.6	5.81	0.00	1100	4.03	14.94	2.6	-307	
8:42	*	290	2.9	5.82	0.00	>1100	4.04	14.94	2.6	-311	
8:47	*	290	3.3	5.82	0.00	>1100	4.04	14.95	2.6	-315	

Sampling Data

Method: GeoPump Date/Time: 9/30/2008 8:50 Total Volume of Water purged: 4

Field Parameters

HORRIBA		HACH TEST KITS	
pH	5.82	Ferrous Iron (mg/L)	0
Spec. Cond.(mS/cm)	4.07	Sulfate	>200
Turbidity (NTU)	>1100	Manganese	orange color instead of pink - couldn't read >3.0
DO (mg/L)	0	CO_2	1272
Temp.(°C)	14.95	Alkalinity	576
TDS (g/L)	2.6	Hydrogen Sulfide	5
ORP (mv)	-316		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: * Substrate material in well causing irratic water level readings - discontinued water level.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: *Ekonol* Well ID: PMW-7D Well Diameter: 2 Inches

Samplers: C. Huey Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
26 - 8.5 x 0.66 = 2.8 gal

Method: GeoPump Date/Time: 9/30/08 15:17

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
15:37	*	450	2.75	5.93	0.00	>1100	4.26	14.69	2.7	-380	very turbid
15:42	*	320	3.25	5.93	0.00	>1100	4.23	15.09	2.7	-381	cloudy grey
15:47	*	320	3.75	5.93	0.00	>1100	4.27	15.28	2.8	-382	
15:52	*	320	4.25	5.95	0.00	>1100	4.34	15.32	2.8	-383	
15:57	*	320	4.75	5.95	0.00	>1100	4.28	15.34	2.8	-383	
16:02	*	320	5.20	5.95	0.00	1000	4.36	15.33	2.8	-384	
16:07	*	320	5.6	5.95	0.00	800	4.38	15.22	2.8	-385	
16:12	*	320	6.0	5.95	0.00	800	4.38	15.22	2.8	-386	
16:17	*	320	6.4	5.95	0.00	800	4.38	15.18	2.8	-386	

Sampling Data

Method: GeoPump Date/Time: 9/30/2008 16:25 Total Volume of Water purged: 8

Field Parameters

HORRIBA		HACH TEST KITS	
pH	5.95	Ferrous Iron (mg/L)	0
Spec. Cond.(mS/cm)	4.40	Sulfate	>200
Turbidity (NTU)	780	Manganese	Dk orange color 2.5-3.0
DO (mg/L)	0	CO_2	3462
Temp.(°C)	15.21	Alkalinity	680
TDS (g/L)	2.8	Hydrogen Sulfide	5
ORP (mv)	-386		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: * No water level - substrate material in well, erratic readings

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: *Ekonol* Well ID: PMW-8D Well Diameter: 2 Inches

Samplers: D.C. Burkert/C.A. Huey Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
27 - 8.5 = 18.5 x 0.16 = 3 gal

Method: GeoPump Date/Time: 9/30/08 8:55

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
8:05	*	360	--	5.87	1.81	697	4.27	15.20	2.7	-329	initial
8:20	*	360	1.25	6.32	0.00	110	5.25	15.13	3.3	-391	
8:25	*	360	2.0	6.27	0.00	110	5.41	15.12	3.4	-388	
8:30	*	360	2.5	6.24	0.00	180	5.53	15.19	3.5	-386	
8:35	*	360	3.0	6.19	0.00	240	5.56	15.19	3.5	-384	
8:45	*	340	4.0	6.16	0.00	240	5.59	15.37	3.5	-380	
8:50	*	340	4.5	6.19	0.00	230	5.70	15.31	3.6	-377	

Sampling Data

Method: Peristaltic Date/Time: 9/30/2008 8:55 Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.19	Ferrous Iron (mg/L)	0
Spec. Cond.(mS/cm)	5.71	Sulfate	>200
Turbidity (NTU)	220	Manganese	Couldn't read 2.5-3.0 orange instead of pink color
DO (mg/L)	0	CO_2	900
Temp.(°C)	15.30	Alkalinity	480
TDS (g/L)	3.6	Hydrogen Sulfide	5
ORP (mv)	-378		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: MS/MSD on VOC. * DTW not possible to gauge.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: *Ekonol* Well ID: RMW-4D Well Diameter: 2 Inches

Samplers: D.C. Burkert/C.A. Huey Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
3 gal

Method: Date/Time: 8/30/08 0:00

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
13:12	NA	300	--	6.86	0.015	60	8.13	16.49	2.5	-319	initial
13:22	NA	300	0.8	6.29	0.00	29	4.00	15.59	2.6	-388	
13:27	NA	300	1.2	6.35	0.00	33	3.99	15.36	2.5	-386	
13:37	NA	300	2.0	6.16	0.00	35	3.97	15.15	2.5	-380	
13:47	NA	300	2.5	6.07	0.00	38	4.10	15.17	2.6	-376	
13:57	NA	300	3.0	6.05	0.00	90	4.17	15.12	2.7	-376	
14:00	NA	300	3.25	6.06	0.00	45	4.18	15.09	2.7	-377	
14:03	NA	300	3.5	6.06	0.00	41	4.19	15.10	2.7	-377	
14:06	NA	300	4.0	6.05	0.00	42	4.18	15.09	2.7	-378	

Sampling Data

Method: Peristaltic Date/Time: 9/30/2008 14:10 Total Volume of Water purged: 5

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.05	Ferrous Iron (mg/L)	0
Spec. Cond.(mS/cm)	4.19	Sulfate	>200
Turbidity (NTU)	39	Manganese	0.9
DO (mg/L)	0	CO_2	4024
Temp.(°C)	15.10	Alkalinity	615
TDS (g/L)	2.7	Hydrogen Sulfide	5
ORP (mv)	-378		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments:

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: *Ekonol* Well ID: MW-7D Well Diameter: 4 Inches

Samplers: D.C. Burkert/C.A. Huey Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
30 - 8.5 = 21.5 x 0.66 = 14 gal

Method: Peristaltic Date/Time: 9/30/08 0:00

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
15:17	NA	300	--	6.05	1.04	85 dark grey	4.34	15.57	2.8	-314	initial
15:37	NA	300	1.5	6.10	0.00	55	5.67	15.90	3.5	-385	clearing
15:47	NA	300	2.25	6.12	0.00	110	5.50	15.70	3.5	-392	
15:57	NA	300	3.0	6.13	0.00	140	5.41	15.79	3.4	-389	
16:07	NA	300	3.75	6.13	0.00	140	5.17	15.71	3.3	-386	
16:10	NA	300	4.5	6.14	0.00	140	5.18	15.72	3.2	-385	
16:13	NA	300	5.00	6.13	0.00	140	5.16	15.70	3.3	-386	

Sampling Data

Method: Peristalitc Date/Time: 9/30/2008 16:16 Total Volume of Water purged: 6.25

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.13	Ferrous Iron (mg/L)	0
Spec. Cond.(mS/cm)	5.17	Sulfate	>200
Turbidity (NTU)	140	Manganese	Rust color >3.0
DO (mg/L)	0	CO_2	3450
Temp.(°C)	15.71	Alkalinity	565
TDS (g/L)	3.3	Hydrogen Sulfide	5
ORP (mv)	-385		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: DTf = 8.25, PTW not possible

PARSONS

Performance Monitoring Event #3

April 2009

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: INJ-01 Well Diameter: 4 Inches

Samplers: HMP Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Geo-Pump/Low Flow Date/Time: 12/15/08 12:44

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
12:44	5.85	260	--	6.11	--	95	2.530	11.59	--	-333.1	
12:49	5.64	260	--	6.05	--	45	2.537	11.31	--	-343.6	
12:54	5.60	260	--	6.04	--	39	2.540	11.28	--	-352.5	
12:59	5.60	260	--	6.04	--	38	2.535	11.39	--	-353.4	
13:04	5.60	260	--	6.04	--	38	2.525	11.50	--	-356.4	
13:09	5.58	260	--	6.04	--	32	2.527	11.34	--	-362.7	
13:14	5.58	260	--	6.04	--	45	2.524	11.42	--	-366.2	
13:19	5.58	260	--	6.04	--	40	2.523	11.51	--	-365.1	
13:24	5.56	260	4.0	6.03	0.00	32	2.523	11.35	--	-358.3	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/15/2008 13:29 Total Volume of Water purged: 4

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.04	Ferrous Iron (mg/L)	0.00
Spec. Cond.(mS/cm)	2.52	Manganese	2.20
Turbidity (NTU)	30.00	Sulfate	>200.00
DO (mg/L)	0.00	CO_2	5500.00
Temp.(°C)	11.35	Hydrogen Sulfide	0.00
TDS (g/L)	--	Alkalinity	800.00
ORP (mv)	-355.70		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: INJ-02 Well Diameter: 4 Inches

Samplers: EPS Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Geo-Pump/Low Flow Date/Time: 12/15/08 12:44

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
13:10	5.52	250	--	6.08	--	--	1.656	11.71	--	-282.6	
13:15	5.53	250	--	6.03	--	114	1.764	12.47	--	-268	
13:20	5.54	250	--	5.95	--	89	1.897	12.12	--	-242	
13:25	5.54	250	--	5.96	--	118	1.909	12.34	--	-243.9	
13:30	5.54	20	--	5.94	--	110	2.023	12.31	--	-261.8	
13:35	5.54	300	--	5.95	--	114	2.141	12.92	--	-284	
13:40	5.54	300	--	5.97	--	80	2.268	12.96	--	-322.6	
13:45	5.54	300	--	6.01	--	77	2.269	12.94	--	-326.8	
13:50	5.54	300	4.0	6.03	0.00	71	2.276	13.01	--	-329.3	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/15/2008 13:29 Total Volume of Water purged: 4

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.03	Ferrous Iron (mg/L)	0.00
Spec. Cond.(mS/cm)	2.28	Manganese	0.00
Turbidity (NTU)	71.00	Sulfate	70.00
DO (mg/L)	0.00	CO_2	636.00
Temp.(°C)	13.01	Hydrogen Sulfide	2.50
TDS (g/L)	--	Alkalinity	650.00
ORP (mv)	-329.30		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Turned Pump up to 300 mL/min at 13:35. Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: PMW-1D Well Diameter: 4 Inches

Samplers: EPS Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
DTW = 6.2

Method: Geo-Pump/Low Flow Date/Time: 12/12/08 9:40

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
9:40	6.40	260	--	7.14	--	180	3.736	8.54	--	-333.1	
9:45	6.40	260	--	7..07	--	100	3.769	9.24	--	-347.5	
9:50	6.40	260	--	7.04	--	41	3.762	9.59	--	-352.4	
9:55	6.40	260	--	7.03	--	16	3.782	9.90	--	-357.9	
10:00	6.40	260	--	6.98	--	11	3.791	10.16	--	-360.4	
10:05	6.40	260	-	6.96	--	12	3.792	10.26	--	-361.2	
10:10	6.40	260	--	6.94	--	8	3.795	10.24	--	-361.5	
10:15	6.40	260	--	6.93	--	8	3.795	10.32	--	-360.7	
10:20	6.40	260	3.5	6.91	0.00	9	3.794	10.53	--	-360.6	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/12/2008 10:20 Total Volume of Water purged: 3.5

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.91	Ferrous Iron (mg/L)	0.00
Spec. Cond.(mS/cm)	3.79	Manganese	0.30
Turbidity (NTU)	9.00	Sulfate	>200.00
DO (mg/L)	0.00	CO_2	746.00
Temp.(°C)	10.53	Hydrogen Sulfide	1.60
TDS (g/L)	--	Alkalinity	380.00
ORP (mv)	-360.60		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-2D | Well Diameter: 2 Inches

Samplers: HMP | Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
26 - 8.5 = 17.5 x 0.16 = 2.8 gal

Method: Geo-Pump/Low Flow Date/Time: 12/11/08 15:15

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
15:15	7.34	250	--	5.92	--	70	2.331	9.97	--	-286.7	
15:20	7.62	250	--	5.74	--	21	2.280	10.82	--	-305.4	
15:25	7.80	250	--	5.61	--	76	2.222	10.86	--	-298.6	
15:30	7.84	250	--	5.63	--	408	2.197	10.78	--	-290.9	
15:35	7.90	250	--	5.57	--	769	2.168	11.36	--	-320.4	
15:40	7.90	250	--	5.61	--	900	2.170	11.39	--	-322.9	
15:45	7.95	250	--	5.63	--	>999	2.188	11.30	--	-322.7	
15:50	7.95	250	--	5.64	--	>999	2.190	11.20	--	-322.9	
15:55	7.95	250	3.0	5.68	0.00	>999	2.200	11.30	--	-323.8	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/11/2008 16:00 Total Volume of Water purged: 5

Field Parameters

HORRIBA		HACH TEST KITS	
pH	5.67	Ferrous Iron (mg/L)	0.60
Spec. Cond.(mS/cm)	2.20	Manganese	0.60
Turbidity (NTU)	740.00	Sulfate	>200.00
DO (mg/L)	0.00	CO_2	936.00
Temp.(°C)	11.32	Hydrogen Sulfide	0.20
TDS (g/L)	--	Alkalinity	160.00
ORP (mv)	-323.60		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	Bottle	Pres.	Method
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-3D | Well Diameter: 2 Inches

Samplers: HMP | Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Geo-Pump/Low Flow Date/Time: 12/11/08 13:45

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
13:45	7.52	250	--	6.33	--	>999	1.392	11.56	--	-313.4	
13:51	7.64	250	--	6.25	--	>999	1.433	11.00	--	-319	
13:56	--	250	--	6.19	--	>999	1.425	11.16	--	-310.3	
14:01	7.86	250	--	6.21	--	>999	1.473	11.34	--	-301.9	
14:06	7.92	250	--	6.30	--	592	1.531	11.45	--	-314.4	
14:11	8.00	250	--	6.37	--	511	1.548	11.24	--	-336.3	
14:16	8.15	250	--	6.39	--	650	1.548	11.33	--	-346.3	
14:21	8.20	250	--	6.40	--	388	1.566	11.08	--	-353.6	
14:26	--	250	--	6.44	--	90	1.590	10.97	--	-356.8	
14:31	8.40	250	--	6.45	--	120	1.595	10.92	--	-357.1	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/11/2008 14:46 Total Volume of Water purged: 5.5

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.45	Ferrous Iron (mg/L)	0.00
Spec. Cond.(mS/cm)	1.61	Manganese	0.00
Turbidity (NTU)	174.00	Sulfate	>200.00
DO (mg/L)	8.20	CO_2	825.00
Temp.(°C)	11.30	Hydrogen Sulfide	1.25
TDS (g/L)	--	Alkalinity	450.00
ORP (mv)	-352.80		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	Bottle	Pres.	Method
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-3D (Cont'd) | Well Diameter: 2 Inches

Samplers: HMP | Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Geo-Pump/Low Flow Date/Time:

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
14:36	8.45	250	--	6.45	--	146	1.600	10.76	--	-359.1	
14:41	8.50	250	3.50	6.45	0.00	180	1.605	10.77	--	-356.2	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: Total Volume of Water purged:

Field Parameters

HORRIBA		HACH TEST KITS	
pH		Ferrous Iron (mg/L)	
Spec. Cond.(mS/cm)		Manganese	
Turbidity (NTU)		Sulfate	
DO (mg/L)		CO_2	
Temp.(°C)		Hydrogen Sulfide	
TDS (g/L)		Alkalinity	
ORP (mv)			

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	Bottle	Pres.	Method
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-4D | Well Diameter: 2 Inches

Samplers: HMP | Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Geo-Pump/Low Flow Date/Time: 12/11/08 10:06

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
10:06	11.10	240	--	6.89	--	9.0	1.622	10.36	--	-342.6	
10:11	11.10	240	--	6.84	--	2.8	1.628	9.62	--	-333.9	
10:16	11.60	240	--	6.81	--	8.0	1.622	9.66	--	-340.2	
10:21	11.52	240	--	6.78	--	13.1	1.603	9.98	--	-351.3	
10:26	11.69	240	--	6.73	--	12.0	1.608	9.18	--	-349	
10:31	11.65	240	--	6.72	--	11.6	1.602	8.62	--	-348.3	
10:36	11.65	240	--	6.67	--	2.9	1.585	9.32	--	-345.7	
10:41	11.55	240	--	6.64	--	4.8	1.582	9.95	--	-348.3	
10:46	11.55	240	3.5	6.63	0.00	8.7	1.586	10.06	--	-349.4	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/11/2008 10:51 Total Volume of Water purged: 3.5

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.61	Ferrous Iron (mg/L)	0.40
Spec. Cond.(mS/cm)	1.59	Manganese	0.00
Turbidity (NTU)	6.73	Sulfate	>200.00
DO (mg/L)	0.00	CO_2	827.00
Temp.(°C)	10.15	Hydrogen Sulfide	2.25
TDS (g/L)	--	Alkalinity	180.00
ORP (mv)	-343.70		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-5D | Well Diameter: 2 Inches

Samplers: HMP | Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Geo-Pump/Low Flow Date/Time: 12/11/08 12:03

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
12:03	12.85	240	--	6.61	--	17.0	1.586	11.17	--	-352.5	slightly cloudy
12:08	13.10	240	--	6.68	--	14.0	1.638	10.14	--	-360.8	clearer
12:13	14.28	240	--	6.63	--	11.8	1.623	10.64	--	-369.8	
12:18	14.83	240	--	6.57	--	12.3	1.623	10.85	--	-358.9	
12:23	15.28	240	--	6.48	--	11.5	1.623	11.10	--	-351	
12:28	15.93	240	--	6.31	--	6.5	1.611	11.39	--	-353.6	
12:33	15.95	240	--	6.27	--	7.8	1.607	11.37	--	-338.1	
12:38	15.95	240	--	6.23	--	5.9	1.593	11.33	--	-337.3	
12:43	16.20	240	--	6.20	--	4.4	1.579	11.34	--	-331.2	
12:48	16.43	240	4.0	6.18	0.00	2.2	1.560	11.40	--	-328.6	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/11/2008 12:53 Total Volume of Water purged: 3

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.16	Ferrous Iron (mg/L)	0.00
Spec. Cond.(mS/cm)	1.56	Manganese	1.80
Turbidity (NTU)	1.96	Sulfate	>200.00
DO (mg/L)	0.00	CO_2	515.00
Temp.(°C)	11.38	Hydrogen Sulfide	0.01
TDS (g/L)	--	Alkalinity	40.00
ORP (mv)	-326.40		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	Bottle	Pres.	Method
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-8D | Well Diameter: 2 Inches

Samplers: EPS | Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot
26 - 8.5 x 0.16 = 2.8 gal

Method: Geo-Pump/Low Flow Date/Time: 12/15/08 10:30

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
11:45	8.42	240	--	6.17	--	--	1.430	13.03	--	-257.3	
11:50	8.44	240	--	6.15	--	--	4.127	13.05	--	-263.7	
11:55	8.45	240	--	6.26	--	45	1.416	12.77	--	-264.4	
12:00	8.46	240	--	6.83	--	31	1.546	12.63	--	-273.2	
12:05	8.47	240	--	7.00	--	16	1.672	12.61	--	-280	
12:10	8.48	240	--	6.96	--	14	1.785	12.74	--	-278.6	
12:15	8.50	240	--	7.10	--	10	1.878	12.61	--	-280.3	
12:20	8.51	240	--	7.13	--	11	1.888	12.40	--	-277.1	
12:25	8.52	240	--	7.00	--	10	1.890	11.96	--	-275	
12:30	8.54	240	4.0	7.03	0.00	8	1.894	11.98	--	-276.5	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/15/2008 12:35 Total Volume of Water purged: 4

Field Parameters

HORRIBA		HACH TEST KITS	
pH	7.04	Ferrous Iron (mg/L)	0.00
Spec. Cond.(mS/cm)	1.92	Manganese	0.90
Turbidity (NTU)	10.00	Sulfate	>200.00
DO (mg/L)	0.00	CO_2	1487.00
Temp.(°C)	11.98	Hydrogen Sulfide	2.25
TDS (g/L)	--	Alkalinity	370.00
ORP (mv)	-275.10		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: PMW-7D | Well Diameter: 2 Inches

Samplers: EPS | Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Geo-Pump/Low Flow Date/Time: 12/15/08 13:10

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
13:15	7.38	250	--	6.33	--	--	2.526	12.74	--	-357.4	
13:20	7.40	250	--	6.35	--	--	2.465	12.32	--	-352.1	
13:25	7.41	250	--	6.35	--	65	2.460	11.97	--	-363	
13:30	7.43	250	--	6.36	--	43	2.443	9.87	--	-353	
13:35	7.44	250	--	6.33	--	27	2.483	10.46	--	-353.5	
13:40	7.46	250	--	6.31	--	13	2.490	10.45	--	-356.2	
13:45	7.46	250	--	6.32	--	10	2.480	10.03	--	-354.6	
13:50	7.47	250	--	6.34	--	8	2.490	9.54	--	-358.1	
13:55	7.48	250	3.5	6.34	0.00	8	2.498	10.50	--	-352.5	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/15/2008 14:05 Total Volume of Water purged: 3.5

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.340	Ferrous Iron (mg/L)	0.00
Spec. Cond.(mS/cm)	2.498	Manganese	1.20
Turbidity (NTU)	8.000	Sulfate	>200.00
DO (mg/L)	0.000	CO_2	3850.00
Temp.(°C)	10.500	Hydrogen Sulfide	0.00
TDS (g/L)	--	Alkalinity	730.00
ORP (mv)	-352.500		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0. MS, MSD, and DUP samples taken. DUP labeled as PMW-70D.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol Well ID: PMW-8D Well Diameter: 2 Inches

Samplers: HMP Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Geo-Pump/Low Flow Date/Time: 12/15/08 11:24

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
11:24	9.68	250	--	6.52	--	85	1.790	12.42	--	-345.8	initial
11:29	--	250	--	6.64	--	75	1.882	11.81	--	-385	
11:34	9.60	250	--	6.67	--	75	1.892	12.04	--	-397.2	
11:39	9.31	250	--	6.67	--	100	1.922	12.11	--	-401	
11:44	9.28	250	--	6.63	--	190	1.970	12.06	--	-404.4	
11:49	9.28	250	--	6.58	--	140	2.050	12.12	--	-404.4	
11:54	9.26	250	--	6.53	--	130	2.129	12.05	--	-402.5	
11:59	9.26	250	--	6.50	--	130	2.220	11.84	--	-398.8	
12:04	9.26	250	3.5	6.51	0.00	120	2.224	11.85	--	-392.6	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/15/2008 12:09 Total Volume of Water purged: 3.5

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.51	Ferrous Iron (mg/L)	0.60
Spec. Cond.(mS/cm)	2.22	Manganese	2.10
Turbidity (NTU)	110.00	Sulfate	>200.00
DO (mg/L)	0.00	CO_2	670.00
Temp.(°C)	11.79	Hydrogen Sulfide	0.03
TDS (g/L)	--	Alkalinity	834.00
ORP (mv)	-390.20		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: RMW-4D | Well Diameter: 2 Inches

Samplers: EPS | Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Geo-Pump/Low Flow Date/Time: 12/11/08 10:25

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
10:30	9.68	200	--	6.34	--	>999	3.139	10.61	--	-346.6	
10:35	9.70	200	--	6.33	--	>999	3.153	10.62	--	-343.8	
10:40	9.72	240	--	6.32	--	>999	3.166	10.78	--	-342.1	
10:45	9.73	240	--	6.30	--	>999	3.172	11.15	--	-338.9	
10:50	9.74	240	--	6.30	--	>999	3.165	11.28	--	-336.2	
10:55	9.74	240	--	6.32	--	>999	3.137	11.42	--	-338.8	
11:00	9.76	300	--	6.42	--	960	2.956	11.63	--	-351.2	
11:05	9.78	300	--	6.45	--	780	2.878	11.98	--	-358.2	
11:10	9.80	300	3.0	6.48	0.00	740	2.880	11.96	--	-350.0	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/11/2008 11:10 Total Volume of Water purged: 3

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.48	Ferrous Iron (mg/L)	0.00
Spec. Cond.(mS/cm)	2.88	Manganese	0.00
Turbidity (NTU)	740.00	Sulfate	>200.0
DO (mg/L)	0.00	CO_2	1196.00
Temp.(°C)	11.96	Hydrogen Sulfide	2.00
TDS (g/L)	--	Alkalinity	200.00
ORP (mv)	-350.00		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Turned pump up to 240 mL/min at 10:45, turned up to 300 mL/min at 11:00. Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0.

PARSONS

LOW FLOW WELL SAMPLING RECORD

Site Name: Ekonol | Well ID: MW-7D | Well Diameter: 4 Inches

Samplers: HMP | Monitored Natural Attenuation Sample Set (Y/N)? Yes

Purging Data

WATER VOLUME CALCULATION
= (Total Depth of Well - Depth To Water) x Casing Volume per Foot

Method: Geo-Pump/Low Flow Date/Time: 12/12/08 9:21

Time	DTW	Pump Rate	Vol.	pH	DO	Turbidity	Spec. Cond.	Temp.	TDS	ORP	Comments
24 hr.	ft.	ml/min.	gal.		mg/L	NTU	mS/cm	°C	g/L	mv	
9:21	NA	260	--	6.14	--	120	1.661	9.60	--	-116.3	
9:26	NA	260	--	5.99	--	100	1.661	9.39	--	-130.8	
9:31	NA	260	--	5.91	--	100	1.647	9.98	--	-137.3	
9:36	NA	260	--	5.73	--	150	1.894	10.14	--	-373.9	
9:40	NA	260	--	5.71	--	>999	1.687	9.73	--	-413.4	
9:46	NA	260	--	5.78	--	140	1.664	9.28	--	-379.2	
9:51	NA	260	--	5.88	--	>999	1.898	9.40	--	-435.8	
9:56	NA	260	--	6.00	--	25	1.900	9.36	--	-364.6	
10:01	NA	260	--	6.03	--	24	1.923	9.20	--	-344.9	
10:06	NA	260	4.0	6.03	0.00	19	1.946	9.32	--	-338.9	

Sampling Data

Method: Geo-Pump/Low Flow Date/Time: 12/12/2008 10:16 Total Volume of Water purged: 4

Field Parameters

HORRIBA		HACH TEST KITS	
pH	6.04	Ferrous Iron (mg/L)	0.00
Spec. Cond.(mS/cm)	1.95	Manganese	1.80
Turbidity (NTU)	26.00	Sulfate	>200.00
DO (mg/L)	0.00	CO_2	337.00
Temp.(°C)	9.36	Hydrogen Sulfide	0.00
TDS (g/L)	--	Alkalinity	180.00
ORP (mv)	-333.90		

* NOTE * HACH test kits are only required for MNA analysis wells.

SAMPLE SET			
Parameter	**Bottle**	**Pres.**	**Method**
Select VOCs	3-40mL	HCl	EPA 8260
MEE RSK-175	3-40mL	HCl	SW3810 modified
TOC	3-40mL	H2SO4	SW9060
Dissolve Metals - total iron (Field filtered, Select wells only)	1-500 mL plastic	Nitric acid	lab specified
Bromide, Chloride, Sulfate	1-250mL plastic	none	lab specified
Volatile Fatty Acids			lab specified

Comments: Probe not reading DO. Took DO reading with HACH kit to confirm DO = 0. Sheen on water - very dark at first.

PARSONS

Appendix D

- Data Usability Summary Reports

DATA USABILITY SUMMARY REPORT

EKONOL FACILITY

Prepared For:

Group Environmental Management Company

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MBC 3-147
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Prepared By:

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MARCH 2008

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SECTION 1

DATA USABILITY SUMMARY

Groundwater samples were collected from the Ekonol site in Wheatfield, New York from January 14, 2008 through January 16, 2008. Analytical results from these samples were reviewed by Parsons for usability with respect to the following requirements:

- Work Plan,
- NYSDEC Analytical Services Protocol (ASP), and
- USEPA Region II Standard Operating Procedures (SOPs).

The analytical laboratory for this project was Columbia Analytical Services, Inc. (CAS). This laboratory is certified to conduct project analyses by the New York State Department of Health (NYDOH) Environmental Laboratory Approval Program (ELAP).

1.1 LABORATORY DATA PACKAGES

The laboratory data package turnaround time, defined as the time from sample receipt by the laboratory to receipt of the analytical data packages by Parsons, was 30 days on average for the Ekonol samples. Comments on specific quality control (QC) and other requirements are discussed in detail in the attached data validation report.

1.2 SAMPLING AND CHAIN-OF-CUSTODY

The samples were collected, properly preserved, shipped under a COC record, and received at the laboratory within one to two days of sampling. All samples were received intact and in good condition at CAS.

1.3 LABORATORY ANALYTICAL METHODS

The groundwater samples collected from the Ekonol site were analyzed for certain chlorinated volatile organic compounds (VOCs), methane, ethane, ethene, metabolic acids, arsenic, manganese, selenium, chloride, bromide, sulfate, and total organic carbon (TOC). Summaries of issues concerning these laboratory analyses are presented in Subsections 1.3.1 through 1.3.4. The data qualifications resulting from the data review and statements on the laboratory analytical precision, accuracy, representativeness, completeness, and comparability (PARCC) are discussed for each analytical method in Section 2. The laboratory data were reviewed and may be qualified with the following validation flags:

"U" - not detected at the value given,

"UJ" - estimated and not detected at the value given,

"J" - estimated at the value given,

"N" - presumptive evidence at the value given, and

"R" - unusable value.

The validated laboratory data were tabulated and are presented in Attachment A.

1.3.1 Volatile Organic Analysis

The groundwater samples collected from the Ekonol site were analyzed for certain chlorinated VOCs using the NYSDEC ASP 8260B analytical method. In addition, the groundwater samples were analyzed for methane, ethane, and ethene using the USEPA approved RSK-175 analytical method. The reported results for these samples did not require qualification resulting from data validation. Therefore, the reported VOC and methane, ethane, and ethene analytical results were 100% complete (i.e., usable) based upon the groundwater data presented by CAS. PARCC requirements were met.

1.3.2 Metabolic Acid Analysis

The groundwater samples collected from the Ekonol site were analyzed for metabolic acids using the CAS SOP HPLC analytical method. The reported results for these samples did not require qualification resulting from data validation. Therefore, the reported metabolic acid analytical results were 100% complete (i.e., usable) based upon the groundwater data presented by CAS. PARCC requirements were met.

1.3.3 Arsenic, Manganese, and Selenium Analysis

The groundwater samples collected from the Ekonol site were analyzed for arsenic, manganese, and selenium using the NYSDEC ASP 6010B analytical method. The reported results for these samples did not require qualification resulting from data validation. Therefore, the reported metals analytical results were 100% complete (i.e., usable) based upon the groundwater data presented by CAS. PARCC requirements were met.

1.3.4 Other Parameters

The groundwater samples collected from the Ekonol site were analyzed for chloride, bromide, sulfate, and TOC using the NYSDEC ASP 300.0 and 415.1 analytical methods. Holding times, laboratory blanks, matrix spike/matrix spike duplicate, laboratory duplicate precision, laboratory control samples, and field duplicate precision were reviewed for compliance. The reported results for these parameters did not require qualification resulting from data validation. Therefore, the reported analytical results for these parameters were 100% complete (i.e., usable) based upon the groundwater data presented by CAS. PARCC requirements were met.

SECTION 2

DATA VALIDATION REPORT

2.1 GROUNDWATER

Data review has been completed for data packages generated by CAS containing groundwater samples collected from the Ekonol site. The specific samples contained in these data packages, the analyses performed, and a usability summary are presented in Table 2.1-1. All of these samples were properly preserved, shipped under a COC record, and received intact by the analytical laboratory. The validated laboratory data are presented in Attachment A.

Data validation was performed for all samples in accordance with the most current editions of the USEPA Region II SOPs and the NYSDEC ASP for organic and inorganic data review. This data validation and usability report is presented by analysis type.

2.1.1 Volatiles Including Methane, Ethane, and Ethene

The following items were reviewed for compliancy in the volatile analysis:

- Custody documentation
- Holding times
- Surrogate recoveries
- Matrix spike/matrix spike duplicate (MS/MSD) precision and accuracy
- Laboratory control sample (LCS) recoveries
- Laboratory method blank and trip blank contamination
- GC/MS instrument performance
- Internal standard responses
- Initial and continuing calibrations
- Sample result identification and verification
- Field duplicate precision
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols with the exception of MS/MSD precision and accuracy.

MS/MSD Precision and Accuracy

All MS/MSD precision (relative percent difference; RPD) and accuracy (percent recovery; %R) measurements were compliant and within QC acceptance limits with the exception of the low MS recoveries for trichloroethene (60%R; QC limit 70-130%R) and methane (41%R; QC

limit 50-150%R) during the spiked analyses of sample PMW-4D. Validation qualification of the unspiked sample PMW-4D was not warranted since MSD results were compliant.

Usability

All volatile groundwater sample results including methane, ethane, and ethene were considered usable following data review.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The volatile groundwater data presented were 100% complete (i.e., usable). The validated laboratory data are tabulated and presented in Attachment A.

It was noted that samples PMW-3D, PMW-103D, PMW-4D, and PMW-8D exceeded calibration ranges for trichloroethene; and samples PMW-1D and RMW-4D exceeded instrument calibration ranges for methane. These samples were diluted and reanalyzed due to these exceedances. Therefore, associated trichloroethene and methane results from the reanalysis of these samples were reported for these samples in the validated laboratory data table in Attachment A.

2.1.2 Metabolic Acids

The following items were reviewed for compliancy in the metabolic acid analysis:

- Custody documentation
- Holding times
- MS/MSD precision and accuracy
- LCS recoveries
- Laboratory method blank contamination
- Initial and continuing calibrations
- Field duplicate precision
- Sample result identification and verification
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols.

Usability

All metabolic acid sample results were considered usable following data review.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The metabolic acid data presented were 100% complete (i.e., usable). The validated laboratory data are tabulated and presented in Attachment A.

2.1.3 Arsenic, Manganese, and Selenium

The following items were reviewed for compliancy in the metals analysis:

- Custody documentation
- Holding times
- Initial and continuing calibration verifications
- Initial and continuing calibration blank and laboratory preparation blank contamination
- Interference control sample
- Matrix spike recoveries
- Laboratory duplicate precision
- LCS recoveries
- ICP serial dilutions
- Field duplicate precision
- Sample result identification and verification
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols.

Usability

All metals sample results were considered usable following data review.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The metals data presented were 100% complete (i.e., usable). The validated groundwater laboratory data are tabulated and presented in Attachment A.

TABLE 2.1-1

SUMMARY OF SAMPLE ANALYSES AND USABILITY
EKONOL - GROUNDWATER

SAMPLE ID	MATRIX	SAMPLE DATE	VOCs	METHANE, ETHANE, ETHENE	ACIDS	METALS	OTHER
PMW-8D	WATER	1/14/08	OK	OK	OK		OK
PMW-6D	WATER	1/14/08	OK	OK	OK		OK
PMW-1D	WATER	1/15/08	OK	OK	OK	OK	OK
MW-7D	WATER	1/15/08	OK	OK	OK	OK	OK
TRIP BLANK	WATER	1/15/08	OK				
INJ-01	WATER	1/15/08	OK	OK	OK		OK
PMW-3D	WATER	1/15/08	OK	OK	OK	OK	OK
RMW-4D	WATER	1/15/08	OK	OK	OK		OK
PMW-103D	WATER	1/15/08	OK	OK	OK	OK	OK
PMW-5D	WATER	1/15/08	OK	OK	OK		OK
TRIP BLANK	WATER	1/15/08	OK				
PMW-4D	WATER	1/16/08	OK	OK	OK	OK	OK
PMW-7D	WATER	1/16/08	OK	OK	OK	OK	OK
PMW-2D	WATER	1/16/08	OK	OK	OK		OK
TRIP BLANK	WATER	1/16/08	OK				
	TOTAL SAMPLES:		15	12	12	6	12

NOTES: OK - Sample analysis considered valid and usable.

ATTACHMENT A

VALIDATED LABORATORY DATA

Ekonol Facility Validated Groundwater Analytical Results Wheatfield, New York January 2008		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	INJ-01 1069551 Columbia R2841769 WATER 1/15/2008 3/4/2008	MW-7D 1069177 Columbia R2841769 WATER 1/15/2008 3/4/2008	PMW-1D 1069176 Columbia R2841769 WATER 1/15/2008 3/4/2008	PMW-2D 1069573 Columbia R2841769 WATER 1/16/2008 3/4/2008	PMW-3D 1069560 Columbia R2841769 WATER 1/15/2008 3/4/2008	Dup of PMW-3D PMW-103D 1069561 Columbia R2841769 WATER 1/15/2008 3/4/2008	PMW-4D 1069571 Columbia R2841769 WATER 1/16/2008 3/4/2008	PMW-5D 1069568 Columbia R2841769 WATER 1/15/2008 3/4/2008	PMW-6D 1069175 Columbia R2841769 WATER 1/14/2008 3/4/2008
CAS NO.	COMPOUND	UNITS:									
	VOLATILES										
71-55-6	1,1,1-Trichloroethane	UG/L	5000 U	360 J	5000 U	5000 U	5000 U	5000 U	5000 U	750 J	500 J
75-31-3	1,1-Dichloroethane	UG/L	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	2500 U	5000 U
75-35-4	1,1-Dichloroethene	UG/L	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	2500 U	5000 U
75-00-3	Chloroethane	UG/L	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	2500 U	5000 U
156-59-2	cis-1,2-Dichloroethene	UG/L	23000	26000	36000	27000	31000	31000	36000	11000	17000
127-18-4	Tetrachloroethene	UG/L	840 J	720 J	930 J	910 J	1400 J	1500 J	1100 J	1700 J	1000 J
156-60-5	trans-1,2-Dichloroethene	UG/L	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	5000 U	2500 U	5000 U
79-01-6	Trichloroethene	UG/L	100000	140000	180000	110000	240000	230000	220000	91000	100000
75-01-4	Vinyl chloride	UG/L	1600 J	690 J	2100	1600 J	640 J	630 J	690 J	420 J	820 J
	RSK-175 VOCs										
74-84-0	ETHANE	UG/L	7	12	5.1	6.9	9.6	9.3	10	5.9	6.5
74-85-1	Ethylene	UG/L	17	15	19	19	20	20	17	19	16
74-82-8	METHANE	UG/L	78	82	120	87	82	83	94	60	62
	METALS										
7440-38-2	Arsenic	UG/L		10 U	10 U		10 U	10 U	10 U		
7439-96-5	Manganese	UG/L		118	287		145	138	149		
7782-49-2	Selenium	UG/L		10 U	10 U		10 U	10 U	10 U		
	OTHER										
24959-67-9	Bromide	MG/L	1 U	1 U	1.04	1 U	1 U	1 U	1 U	1 U	1 U
16667-00-6	Chloride	MG/L	229	206	265	230	220	219	217	189	194
14806-79-8	Sulfate	MG/L	1480	1150	1460	1410	987	1110	1080	710	1030
7440-44-0	Total Organic Carbon	MG/L	6.46	7.79	11.8	7.62	11	10.3	12.2	4.8	6.68
	METABOLIC ACIDS										
64-19-7	ACETIC ACID	MG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
107-92-6	BUTYRIC ACID	MG/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
50-21-5	LACTIC ACID	MG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
79-09-4	PROPIONIC ACID	MG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
127-17-3	PYRUVIC ACID	MG/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Ekonol Facility Validated Groundwater Analytical Results Wheatfield, New York January 2008		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	PMW-7D 1069572 Columbia R2841769 WATER 1/16/2008 3/4/2008	PMW-8D 1069174 Columbia R2841769 WATER 1/14/2008 3/4/2008	RMW-4D 1069550 Columbia R2841769 WATER 1/15/2008 3/4/2008	TB010908 1069178 Columbia R2841769 WATER 1/9/2008 3/4/2008	TB011508-1 1069574 Columbia R2841769 WATER 1/15/2008 3/4/2008	TB011508-2 1069909 Columbia R2841769 WATER 1/15/2008 3/4/2008
CAS NO.	COMPOUND	UNITS:						
	VOLATILES							
71-55-6	1,1,1-Trichloroethane	UG/L	5000 U	5000 U	5000 U	5 U	5 U	5 U
75-31-3	1,1-Dichloroethane	UG/L	5000 U	5000 U	5000 U	5 U	5 U	5 U
75-35-4	1,1-Dichloroethene	UG/L	5000 U	5000 U	5000 U	5 U	5 U	5 U
75-00-3	Chloroethane	UG/L	5000 U	5000 U	5000 U	5 U	5 U	5 U
156-59-2	cis-1,2-Dichloroethene	UG/L	27000	28000	18000	5 U	5 U	5 U
127-18-4	Tetrachloroethene	UG/L	950 J	1200 J	570 J	5 U	5 U	5 U
156-60-5	trans-1,2-Dichloroethene	UG/L	5000 U	5000 U	5000 U	5 U	5 U	5 U
79-01-6	Trichloroethene	UG/L	160000	240000	130000	5 U	5 U	5 U
75-01-4	Vinyl chloride	UG/L	860 J	1100 J	430 J	2 U	2 U	2 U
	RSK-175 VOCs							
74-84-0	ETHANE	UG/L	7.2	5.1	19			
74-85-1	Ethylene	UG/L	18	17	14			
74-82-8	METHANE	UG/L	80	78	110			
	METALS							
7440-38-2	Arsenic	UG/L	10 U					
7439-96-5	Manganese	UG/L	165					
7782-49-2	Selenium	UG/L	10 U					
	OTHER							
24959-67-9	Bromide	MG/L	1 U	1.09	1.11			
16667-00-6	Chloride	MG/L	226	222	135			
14806-79-8	Sulfate	MG/L	1170	1590	1340			
7440-44-0	Total Organic Carbon	MG/L	8.94	10.6	7.67			
	METABOLIC ACIDS							
64-19-7	ACETIC ACID	MG/L	1 U	1 U	1 U			
107-92-6	BUTYRIC ACID	MG/L	2 U	2 U	2 U			
50-21-5	LACTIC ACID	MG/L	1 U	1 U	1 U			
79-09-4	PROPIONIC ACID	MG/L	1 U	1 U	1 U			
127-17-3	PYRUVIC ACID	MG/L	0.5 U	0.5 U	0.5 U			

DATA USABILITY SUMMARY REPORT

EKONOL FACILITY

Prepared For:

Atlantic Richfield Company

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SEPTEMBER 2008

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SECTION 1

DATA USABILITY SUMMARY

Groundwater samples were collected from the Ekonol Facility site in Wheatfield, New York from July 22, 2008 through July 25, 2008. Analytical results from these samples were reviewed by Parsons for usability with respect to the following requirements:

- Work Plan,
- NYSDEC Analytical Services Protocol (ASP), and
- USEPA Region II Standard Operating Procedures (SOPs).

The analytical laboratory for this project was Columbia Analytical Services, Inc. (CAS). This laboratory is approved to conduct project analyses through the New York Department of Health (NYDOH) Environmental Laboratory Approval Program (ELAP).

1.1 LABORATORY DATA PACKAGES

The laboratory data package turnaround time, defined as the time from sample receipt by the laboratory to receipt of the analytical data packages by Parsons, was 31 days on average for the Ekonol samples. Comments on specific quality control (QC) and other requirements are discussed in detail in the attached data validation report.

1.2 SAMPLING AND CHAIN-OF-CUSTODY

The samples were collected, properly preserved, shipped under a COC record, and received at the laboratory within one day of sampling. All samples were received intact and in good condition at CAS. It was noted that samples collected on 7/24/08 and 7/25/08 were received at CAS at 13ºC.

1.3 LABORATORY ANALYTICAL METHODS

The groundwater samples collected from the Ekonol site were analyzed for volatile organic compounds (VOCs) including methane, ethane, and ethane; the metals arsenic, manganese, selenium; metabolic acids; bromide; chloride; sulfate; and/or total organic carbon (TOC). Summaries of issues concerning these laboratory analyses are presented in Subsections 1.3.1 through 1.3.3. The data qualifications resulting from the data review and statements on the laboratory analytical precision, accuracy, representativeness, completeness, and comparability (PARCC) are discussed for each analytical method in Section 2. The laboratory data were reviewed and may be qualified with the following validation flags:

"U" - not detected at the value given,

"UJ" - estimated and not detected at the value given,

"J" - estimated at the value given,

"N" - presumptive evidence at the value given, and

"R" - unusable value.

The validated laboratory data were tabulated and are presented in Attachment A.

1.3.1 Volatile Organic Analysis Including Methane, Ethane, and Ethene

The groundwater samples collected from the Ekonol site were analyzed for VOCs using the USEPA SW-846 8260B analytical method. In addition, certain groundwater samples were analyzed for methane, ethane, and ethene using the modified USEPA approved RSK-175 analytical method. Certain reported results for the VOC samples were considered estimated due to a noncompliant sample shipping container temperature upon laboratory receipt. Therefore, the reported VOC and methane, ethane, and ethene analytical results were 100% complete (i.e., usable) based upon the groundwater data presented. PARCC requirements were met.

1.3.2 Metals Analysis

Certain groundwater samples collected from the Ekonol site were analyzed for arsenic, manganese, and selenium using the USEPA SW-846 6010B analytical method. Certain reported results for the metals samples were considered estimated due to a noncompliant sample shipping container temperature upon laboratory receipt. Therefore, the reported metals analytical results were 100% complete (i.e., usable) based upon the groundwater data presented. PARCC requirements were met.

1.3.3 Other Parameters

Certain groundwater samples collected from the Ekonol site were analyzed for metabolic acids using a CAS HPLC modified analytical method; bromide, chloride, and sulfate using the USEPA 300.0 analytical method; and TOC using the USEPA SW-846 9060 analytical method. Holding times, laboratory blanks, matrix spike/matrix spike duplicate, laboratory duplicate precision, laboratory control samples, instrument calibrations, quantitation limits, sample result identification, and field duplicate precision were reviewed for compliance. Certain reported results for these samples were considered estimated due to a noncompliant sample shipping container temperature upon laboratory receipt. As a result, positive result positive results were qualified “J” and nondetected results qualified “UJ” for these samples. Therefore, the reported analytical results for the wet chemistry parameters were 100% complete (i.e., usable) based upon the groundwater data presented. PARCC requirements were met.

SECTION 2

DATA VALIDATION REPORT

2.1 GROUNDWATER SAMPLES

Data review has been completed for data packages generated by CAS containing groundwater samples collected from the Ekonol Facility site. The specific samples contained in these data packages, the analyses performed, and a usability summary are presented in Table 2.1-1. All of these samples were properly preserved, shipped under a COC record, and received intact by the analytical laboratory. The validated laboratory data are presented in Attachment A.

Data validation was performed for all samples in accordance with the most current editions of the USEPA Region II SOPs and the NYSDEC ASP for organic and inorganic data review. This data validation and usability report is presented by analysis type.

2.1.1 Volatiles Including Methane, Ethane, and Ethene

The following items were reviewed for compliancy in the volatile analysis:

- Custody documentation
- Holding times
- Surrogate recoveries
- Matrix spike/matrix spike duplicate (MS/MSD) precision and accuracy
- Laboratory control sample (LCS) recoveries
- Laboratory method blank and trip blank contamination
- Instrument performance
- Initial and continuing calibrations
- Internal standard responses
- Field duplicate precision
- Sample result verification and identification
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols with the exception of MS/MSD precision and accuracy and blank contamination.

MS/MSD Precision and Accuracy

All MS/MSD precision (relative percent difference; RPD) and accuracy (percent recovery; %R) measurements were compliant and within QC acceptance limits for all spiked compounds with the exception of the high MSD recovery for 1,1-dichloroethene (132%R; QC limit 70-130%R) during the spiked analysis of sample PMW-8D. Validation qualification of the unspiked sample PMW-8D was not warranted since the associated MS recovery was compliant.

Blank Contamination

The laboratory blank METHOD BLANK (7/25/08) associated with all methane, ethane, and ethane samples contained methane at a concentration of 1.6 μg/L. Validation qualification of the methane results was not warranted since sample concentrations were not affected by the contamination in this blank.

Usability

All volatile groundwater sample results including methane, ethane, and ethene were considered usable following data validation.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The volatile groundwater presented were 100% (i.e., usable). The validated volatile laboratory data are tabulated and presented in Attachment A.

It was noted that samples collected on 7/24/08 and 7/25/08 were received at CAS at 13ºC. Therefore, these samples were considered estimated, possibly biased low, with positive results qualified "J" and nondetected results qualified "UJ".

2.1.2 Arsenic, Manganese, and Selenium

The following items were reviewed for compliancy in the metals analysis:

- Custody documentation
- Holding times
- Initial and continuing calibration, and preparation blank contamination
- Initial and continuing calibration verifications
- Interference check sample recoveries
- Matrix spike recoveries
- Laboratory duplicate precision
- Field duplicate precision
- Laboratory control sample recoveries

- Serial dilutions
- Sample result verification and identification
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols.

Usability

All metals sample results were considered usable following data validation.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The metals data presented were 100% complete (i.e., usable). The validated groundwater laboratory data are tabulated and presented in Attachment A.

It was noted that samples collected on 7/24/08 and 7/25/08 were received at CAS at 13ºC. Therefore, these samples were considered estimated, possibly biased low, with positive results qualified "J" and nondetected results qualified "UJ".

TABLE 2.1-1

SUMMARY OF SAMPLE ANALYSES AND USABILITY
EKONOL FACILITY – GROUNDWATER

SAMPLE ID	MATRIX	SAMPLE DATE	VOCs	METHANE, ETHANE, ETHENE	METALS	OTHER
PMW-5D	WATER	7/22/08	OK	OK		OK
PMW-6D	WATER	7/22/08	OK	OK		OK
PMW-3D	WATER	7/22/08	OK	OK	OK	OK
PMW-4D	WATER	7/22/08	OK	OK		OK
PMW-2D	WATER	7/23/08	OK	OK		OK
PMW-8D	WATER	7/23/08	OK	OK		OK
TRIP BLANK	WATER	7/22/08	OK	OK		OK
INJ-01	WATER	7/24/08	OK	OK		OK
RMW-4D	WATER	7/24/08	OK	OK	OK	OK
PMW-7D	WATER	7/24/08	OK	OK	OK	OK
PMW-70D	WATER	7/24/08	OK	OK	OK	OK
MW-7D	WATER	7/25/08	OK	OK	OK	OK
PMW-1D	WATER	7/25/08	OK		OK	
	TOTAL SAMPLES		13	12	6	12

NOTES: OK - Sample analysis considered valid and usable.

ATTACHMENT A

VALIDATED LABORATORY DATA

Ekonol Facility Validated Groundwater Analytical Results Wheatfield, New York SDG: R2845070		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	INJ-01 1121095 Columbia R2845070 WATER 7/24/2008 8/30/2008	MW-7D 1121099 Columbia R2845070 WATER 7/25/2008 8/30/2008	PMW-1D 1121100 Columbia R2845070 WATER 7/25/2008 8/30/2008	PMW-2D 1120235 Columbia R2845070 WATER 7/23/2008 8/30/2008	PMW-3D 1120233 Columbia R2845070 WATER 7/22/2008 8/30/2008	PMW-4D 1120234 Columbia R2845070 WATER 7/22/2008 8/30/2008	PMW-5D 1120231 Columbia R2845070 WATER 7/22/2008 8/30/2008	PMW-6D 1120232 Columbia R2845070 WATER 7/22/2008 8/30/2008
CAS NO.	COMPOUND	UNITS:								
	VOLATILES									
75-00-3	Chloroethane	UG/L	5000 UJ	5000 UJ	2500 UJ	5000 U	2500 U	5000 U	5000 U	5000 U
75-34-3	1,1-Dichloroethane	UG/L	5000 UJ	5000 UJ	2500 UJ	5000 U	2500 U	5000 U	5000 U	5000 U
75-35-4	1,1-Dichloroethene	UG/L	5000 UJ	5000 UJ	260 J	380 J	2500 U	350 J	5000 U	5000 U
156-59-2	cis-1,2-Dichloroethene	UG/L	150000 J	130000 J	82000 J	150000	83000	160000	100000	140000
156-60-5	trans-1,2-Dichloroethene	UG/L	380 J	360 J	200 J	580 J	210 J	510 J	430 J	380 J
127-18-4	Tetrachloroethene	UG/L	5000 UJ	5000 UJ	280 J	5000 U	2500 U	5000 U	5000 U	5000 U
71-55-6	1,1,1-Trichloroethane	UG/L	5000 UJ	5000 UJ	2500 UJ	5000 U	2500 U	5000 U	5000 U	5000 U
79-01-6	Trichloroethene	UG/L	2600 J	5000 UJ	17000 J	1100 J	540 J	3500 J	950 J	2200 J
75-01-4	Vinyl Chloride	UG/L	1600 J	900 J	3900 J	1800 J	760 J	1100 J	1800 J	1200 J
	RSK-175 VOCs									
74-84-0	Ethane	UG/L	9.2 J	16 J	3.8 J	7.6	16	12	10	11
74-85-1	Ethene	UG/L	52 J	28 J	16 J	34	24	38	72	37
74-82-8	Methane	UG/L	100 J	72 J	68 J	110	120	110	120	100
	METALS									
7440-38-2	Arsenic	UG/L		10 UJ	10 UJ		10 U	10 U		
7439-96-5	Manganese	UG/L		723 J	479 J		471	557		
7782-49-2	Selenium	UG/L		10 UJ	10 UJ		10 U	10 U		
	OTHER									
BROMIDE	Bromide	MG/L	6.64 J	25.2 J	2.04 J	21.7	11.2	9.95	8.51	27
16887-00-6	Chloride	MG/L	335 J	330 J	424 J	358	286	330	273	347
14808-79-8	Sulfate	MG/L	1150 J	1190 J	2200 J	1250	1170	1520	982	1220
TOC	Total Organic Carbon	MG/L	202 J	480 J	22.4 J	1020	1800	237	332	627
	FATTY ACIDS									
64-19-7	Acetic Acid	MG/L	160 J	280 J	33 J	210	170	180	170	210
107-92-6	Butyric Acid	MG/L	17 J	16 J	2 UJ	32	24	13	15	32
50-21-5	Lactic Acid	MG/L	1 UJ	1 UJ	1 UJ	1 U	1 U	1 U	1 U	1 U
79-09-4	Propionic Acid	MG/L	140 J	390 J	1.6 J	260	170	190	120	240
127-17-3	Pyruvic Acid	MG/L	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Ekonol Facility Validated Groundwater Analytical Results Wheatfield, New York SDG: R2845070		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	PMW-7D 1121097 Columbia R2845070 WATER 7/24/2008 8/30/2008	Dup of PMW-7D PMW-70D 1121098 Columbia R2845070 WATER 7/24/2008 8/30/2008	PMW-8D 1120236 Columbia R2845070 WATER 7/23/2008 8/30/2008	RMW-4D 1121096 Columbia R2845070 WATER 7/24/2008 8/30/2008	TRIP BLANK 1121161 Columbia R2845070 WATER 7/22/2008 8/30/2008
CAS NO.	COMPOUND	UNITS:					
	VOLATILES						
75-00-3	Chloroethane	UG/L	5000 UJ	5000 UJ	1000 U	5000 UJ	5 U
75-34-3	1,1-Dichloroethane	UG/L	5000 UJ	5000 UJ	1000 U	5000 UJ	5 U
75-35-4	1,1-Dichloroethene	UG/L	5000 UJ	5000 UJ	240 J	5000 UJ	5 U
156-59-2	cis-1,2-Dichloroethene	UG/L	120000 J	110000 J	110000	100000 J	5 U
156-60-5	trans-1,2-Dichloroethene	UG/L	5000 UJ	5000 UJ	300 J	5000 UJ	5 U
127-18-4	Tetrachloroethene	UG/L	5000 UJ	5000 UJ	1000 U	5000 UJ	5 U
71-55-6	1,1,1-Trichloroethane	UG/L	5000 UJ	5000 UJ	1000 U	5000 UJ	5 U
79-01-6	Trichloroethene	UG/L	5000 UJ	430 J	2900 J	450 J	5 U
75-01-4	Vinyl Chloride	UG/L	940 J	1200 J	1500 J	1100 J	2 U
	RSK-175 VOCs						
74-84-0	Ethane	UG/L	7.4 J	6.6 J	7.2	15 J	
74-85-1	Ethene	UG/L	37 J	34 J	29	46 J	
74-82-8	Methane	UG/L	76 J	68 J	100	110 J	
	METALS						
7440-38-2	Arsenic	UG/L	10 UJ	10 UJ			
7439-96-5	Manganese	UG/L	497 J	476 J			
7782-49-2	Selenium	UG/L	10 UJ	10 UJ			
	OTHER						
BROMIDE	Bromide	MG/L	20.5 J	20.8 J	20.6	8.82 J	
16887-00-6	Chloride	MG/L	288 J	285 J	320	273 J	
14808-79-8	Sulfate	MG/L	984 J	977 J	1810	1060 J	
TOC	Total Organic Carbon	MG/L	417 J	382 J	551	387 J	
	FATTY ACIDS						
64-19-7	Acetic Acid	MG/L	290 J	290 J	170	210 J	
107-92-6	Butyric Acid	MG/L	17 J	18 J	14	13 J	
50-21-5	Lactic Acid	MG/L	1 UJ	1 UJ	1 U	1 UJ	
79-09-4	Propionic Acid	MG/L	300 J	300 J	160	190 J	
127-17-3	Pyruvic Acid	MG/L	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	

DATA USABILITY SUMMARY REPORT

EKONOL FACILITY

Prepared For:

Atlantic Richfield Company

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Prepared By:

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NOVEMBER 2008

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SECTION 1

DATA USABILITY SUMMARY

Groundwater samples were collected from the Ekonol Facility site in Wheatfield, New York from September 29, 2008 through October 1, 2008. Analytical results from these samples were reviewed by Parsons for usability with respect to the following requirements:

- Work Plan,
- NYSDEC Analytical Services Protocol (ASP), and
- USEPA Region II Standard Operating Procedures (SOPs).

The analytical laboratory for this project was Columbia Analytical Services, Inc. (CAS). This laboratory is approved to conduct project analyses through the New York Department of Health (NYDOH) Environmental Laboratory Approval Program (ELAP).

1.1 LABORATORY DATA PACKAGES

The laboratory data package turnaround time, defined as the time from sample receipt by the laboratory to receipt of the analytical data packages by Parsons, was 42 days on average for the Ekonol samples. Comments on specific quality control (QC) and other requirements are discussed in detail in the attached data validation report.

1.2 SAMPLING AND CHAIN-OF-CUSTODY

The samples were collected, properly preserved, shipped under a COC record, and received at the laboratory within one day of sampling. All samples were received intact and in good condition at CAS.

1.3 LABORATORY ANALYTICAL METHODS

The groundwater samples collected from the Ekonol site were analyzed for volatile organic compounds (VOCs) including methane, ethane, and ethane; the dissolved metals arsenic, manganese, selenium; metabolic acids; bromide; chloride; sulfate; and/or total organic carbon (TOC). Summaries of issues concerning these laboratory analyses are presented in Subsections 1.3.1 through 1.3.3. The data qualifications resulting from the data review and statements on the laboratory analytical precision, accuracy, representativeness, completeness, and comparability (PARCC) are discussed for each analytical method in Section 2. The laboratory data were reviewed and may be qualified with the following validation flags:

"U" - not detected at the value given,

"UJ" - estimated and not detected at the value given,

"J" - estimated at the value given,

"N" - presumptive evidence at the value given, and

"R" - unusable value.

The validated laboratory data were tabulated and are presented in Attachment A.

1.3.1 Volatile Organic Analysis Including Methane, Ethane, and Ethene

The groundwater samples collected from the Ekonol site were analyzed for VOCs using the USEPA SW-846 8260B analytical method. In addition, certain groundwater samples were analyzed for methane, ethane, and ethene using the modified USEPA approved RSK-175 analytical method. Certain reported results for the VOC samples were considered estimated due to sample headspace prior to analysis . Therefore, the reported VOC and methane, ethane, and ethene analytical results were 100% complete (i.e., usable) based upon the groundwater data presented. PARCC requirements were met.

1.3.2 Metals Analysis

Certain groundwater samples collected from the Ekonol site were analyzed for arsenic, manganese, and selenium using the USEPA SW-846 6010B analytical method. The reported results for the metals samples did not require qualification resulting from data validation. Therefore, the reported metals analytical results were 100% complete (i.e., usable) based upon the groundwater data presented. PARCC requirements were met.

1.3.3 Other Parameters

Certain groundwater samples collected from the Ekonol site were analyzed for metabolic acids using a CAS HPLC modified analytical method; bromide, chloride, and sulfate using the USEPA 300.0 analytical method; and TOC using the USEPA SW-846 9060 analytical method. Holding times, laboratory blanks, matrix spike/matrix spike duplicate, laboratory duplicate precision, laboratory control samples, instrument calibrations, quantitation limits, sample result identification, and field duplicate precision were reviewed for compliance. The reported results for these samples did not require qualification resulting from data validation. Therefore, the reported analytical results for the wet chemistry parameters were 100% complete (i.e., usable) based upon the groundwater data presented. PARCC requirements were met.

SECTION 2

DATA VALIDATION REPORT

2.1 GROUNDWATER SAMPLES

Data review has been completed for data packages generated by CAS containing groundwater samples collected from the Ekonol Facility site. The specific samples contained in these data packages, the analyses performed, and a usability summary are presented in Table 2.1-1. All of these samples were properly preserved, shipped under a COC record, and received intact by the analytical laboratory. The validated laboratory data are presented in Attachment A.

Data validation was performed for all samples in accordance with the most current editions of the USEPA Region II SOPs and the NYSDEC ASP for organic and inorganic data review. This data validation and usability report is presented by analysis type.

2.1.1 Volatiles Including Methane, Ethane, and Ethene

The following items were reviewed for compliancy in the volatile analysis:

- Custody documentation
- Holding times
- Surrogate recoveries
- Matrix spike/matrix spike duplicate (MS/MSD) precision and accuracy
- Laboratory control sample (LCS) recoveries
- Laboratory method blank and trip blank contamination
- Instrument performance
- Initial and continuing calibrations
- Internal standard responses
- Field duplicate precision
- Sample result verification and identification
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols.

Usability

All volatile groundwater sample results including methane, ethane, and ethene were considered usable following data validation.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The volatile groundwater presented were 100% (i.e., usable). The validated volatile laboratory data are tabulated and presented in Attachment A.

It was noted that all of the VOC samples reacted with the acid preservative. As a result, significant headspace was observed in VOC sample RMW-4D. Therefore, the VOC results for this sample were considered estimated, possibly biased low, with positive results qualified "J" and nondetected results qualified "UJ".

2.1.2 Arsenic, Manganese, and Selenium

The following items were reviewed for compliancy in the metals analysis:

- Custody documentation
- Holding times
- Initial and continuing calibration, and preparation blank contamination
- Initial and continuing calibration verifications
- Interference check sample recoveries
- Matrix spike recoveries
- Laboratory duplicate precision
- Field duplicate precision
- Laboratory control sample recoveries
- Serial dilutions
- Sample result verification and identification
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols.

Usability

All metals sample results were considered usable following data validation.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The metals data presented were 100% complete (i.e., usable). The validated groundwater laboratory data are tabulated and presented in Attachment A.

TABLE 2.1-1

SUMMARY OF SAMPLE ANALYSES AND USABILITY
EKONOL FACILITY – GROUNDWATER

SAMPLE ID	MATRIX	SAMPLE DATE	VOCs	METHANE, ETHANE, ETHENE	METALS	OTHER
PMW-2D	WATER	9/29/08	OK	OK		OK
PMW-5D	WATER	9/29/08	OK	OK		OK
PMW-6D	WATER	9/30/08	OK	OK		OK
PMW-8D	WATER	9/30/08	OK	OK		OK
PMW-3D	WATER	9/30/08	OK	OK	OK	OK
PMW-103D	WATER	9/30/08	OK	OK	OK	OK
TS-INJ-1	WATER	9/30/08	OK	OK		OK
TRIP BLANK	WATER	9/30/08	OK			
RMW-4D	WATER	9/30/08	OK	OK		OK
PMW-1D	WATER	9/30/08	OK	OK	OK	OK
PMW-4D	WATER	9/30/08	OK	OK	OK	OK
PMW-7D	WATER	9/30/08	OK	OK	OK	OK
MW-7D	WATER	9/30/08	OK	OK	OK	OK
TRIP BLANK	WATER	10/1/08	OK			
	TOTAL SAMPLES		14	12	6	12

NOTES: OK - Sample analysis considered valid and usable.

ATTACHMENT A

VALIDATED LABORATORY DATA

Ekonol Facility Validated Groundwater Analytical Results Wheatfield, New York SDG: R2846180		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	MW-7D 1139922 Columbia R2846180 Water 9/30/2008 11/19/2008	PMW-1D 1139917 Columbia R2846180 Water 10/1/2008 11/19/2008	PMW-2D 1139516 Columbia R2846180 Water 9/29/2008 11/19/2008	PMW-3D 1139520 Columbia R2846180 Water 9/29/2008 11/19/2008	Dup of PMW-3D PMW-103D 1139521 Columbia R2846180 Water 9/29/2008 11/19/2008	PMW-4D 1139921 Columbia R2846180 Water 9/30/2008 11/19/2008	PMW-5D 1139517 Columbia R2846180 Water 9/29/2008 11/19/2008	PMW-6D 1139518 Columbia R2846180 Water 9/29/2008 11/19/2008	PMW-7D 1139923 Columbia R2846180 Water 9/30/2008 11/19/2008
CAS NO.	COMPOUND	UNITS:									
	VOLATILES										
75-00-3	Chloroethane	ug/L	2500 U	5000 U	5000 U	250 U	250 U	1300 U	2500 U	2500 U	5000 U
75-34-3	1,1-Dichloroethane	ug/L	2500 U	5000 U	5000 U	250 U	250 U	1300 U	2500 U	2500 U	5000 U
75-35-4	1,1-Dichloroethene	ug/L	140 J	310 J	210 J	15 J	13 J	140 J	200 J	160 J	280 J
156-59-2	cis-1,2-Dichloroethene	ug/L	59000	110000	120000	9000	8800	91000	92000	92000	100000
156-60-5	trans-1,2-Dichloroethene	ug/L	740 J	1900 J	680 J	50 J	56 J	990 J	500 J	540 J	840 J
127-18-4	Tetrachloroethene	ug/L	2500 U	5000 U	5000 U	13 J	250 U	1300 U	2500 U	2500 U	5000 U
71-55-6	1,1,1-Trichloroethane	ug/L	2500 U	5000 U	5000 U	16 J	17 J	1300 U	2500 U	2500 U	5000 U
79-01-6	Trichloroethene	ug/L	1200 J	38000	3200 J	1000	1000	5900	4800	2800	2300 J
75-01-4	Vinyl Chloride	ug/L	1500	2200	2600	99 J	130	1400	2400	1900 J	1700 J
74-84-0	Ethane	ug/L	4.4	14	5.8	35	28	9.1	8.8	12	7.5
74-85-1	Ethene	ug/L	13	23	16	4.7	3.8	10	18	14	13
74-82-8	Methane	ug/L	55	230	89	160	140	77	85	71	59
	METALS										
7440-38-2	Arsenic, Dissolved	ug/L	10 U	10 U		10 U	10 U	10 U			10 U
7439-96-5	Manganese, Dissolved	ug/L	506	325		70.7	56.9	360			388
7782-49-2	Selenium, Dissolved	ug/L	10 U	10 U		10 U	10 U	10 U			10 U
	OTHER										
BROMIDE	Bromide	mg/L	3.93	1 U	8.7	5.06	5.11	3.95	4.43	5.78	4.98
16887-00-6	Chloride	mg/L	260	833	552	168	166	245	977	446	219
14808-79-8	Sulfate	mg/L	1280	1210	843	1010	1010	108	730	610	724
TOC	Total Organic Carbon	mg/L	212	33.1	748	558	514	227	383	565	531
ACETIC ACID	Acetic Acid	mg/L	320	22	370	140	140	170	370	510	660
BUTANOIC A	Butanoic Acid	mg/L	5.6	2.9	73	48	47	12	28	52	51
LACTIC ACID	Lactic Acid	mg/L	1 U	1.3	1 U	6.5	6.6	1 U	1 U	1 U	1 U
PROPIONIC A	Propionic Acid	mg/L	59	6.7	240	75	74	55	130	200	190
PYRUVIC AC	Pyruvic Acid	mg/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Ekonol Facility Validated Groundwater Analytical Results Wheatfield, New York SDG: R2846180		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	PMW-8D 1139519 Columbia R2846180 Water 9/29/2008 11/19/2008	RMW-4D 1139919 Columbia R2846180 Water 9/30/2008 11/19/2008	TS-INJ-1 1139522 Columbia R2846180 Water 9/29/2008 11/19/2008	TB092908 1139523 Columbia R2846180 Water 9/29/2008 11/19/2008	TB093008 1139924 Columbia R2846180 Water 9/30/2008 11/19/2008
CAS NO.	COMPOUND	UNITS:					
	VOLATILES						
75-00-3	Chloroethane	ug/L	2500 U	1300 UJ	5000 U	5 U	5 U
75-34-3	1,1-Dichloroethane	ug/L	2500 U	1300 UJ	5000 U	5 U	5 U
75-35-4	1,1-Dichloroethene	ug/L	200 J	75 J	210 J	5 U	5 U
156-59-2	cis-1,2-Dichloroethene	ug/L	76000	38000 J	110000	5 U	5 U
156-60-5	trans-1,2-Dichloroethene	ug/L	420 J	370 J	920 J	5 U	5 U
127-18-4	Tetrachloroethene	ug/L	240 J	1300 UJ	5000 U	5 U	5 U
71-55-6	1,1,1-Trichloroethane	ug/L	2500 U	1300 UJ	5000 U	5 U	5 U
79-01-6	Trichloroethene	ug/L	34000	3700 J	3300 J	5 U	5 U
75-01-4	Vinyl Chloride	ug/L	2100	680 J	2900 J	2 U	2 U
74-84-0	Ethane	ug/L	5.9	23	6.5		
74-85-1	Ethene	ug/L	16	7.1	16		
74-82-8	Methane	ug/L	92	130	100		
	METALS						
7440-38-2	Arsenic, Dissolved	ug/L					
7439-96-5	Manganese, Dissolved	ug/L					
7782-49-2	Selenium, Dissolved	ug/L					
	OTHER						
BROMIDE	Bromide	mg/L	4.72	2.59	3.51		
16887-00-6	Chloride	mg/L	283	260	539		
14808-79-8	Sulfate	mg/L	2410	810	917		
TOC	Total Organic Carbon	mg/L	190	294	333		
ACETIC ACID	Acetic Acid	mg/L	200	340	310		
BUTANOIC A	Butanoic Acid	mg/L	13	27	35		
LACTIC ACID	Lactic Acid	mg/L	1 U	1 U	1 U		
PROPIONIC A	Propionic Acid	mg/L	70	120	130		
PYRUVIC AC	Pyruvic Acid	mg/L	0.5 U	0.5 U	0.5 U		

DATA USABILITY SUMMARY REPORT

EKONOL FACILITY

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FEBRUARY 2009

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SECTION 1

DATA USABILITY SUMMARY

Groundwater samples were collected from the Ekonol Facility site in Wheatfield, New York from December 11, 2008 through December 15, 2008. Analytical results from these samples were reviewed by Parsons for usability with respect to the following requirements:

- Work Plan,
- NYSDEC Analytical Services Protocol (ASP), and
- USEPA Region II Standard Operating Procedures (SOPs).

The analytical laboratory for this project was Columbia Analytical Services, Inc. (CAS). This laboratory is approved to conduct project analyses through the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP).

1.1 LABORATORY DATA PACKAGES

The laboratory data package turnaround time, defined as the time from sample receipt by the laboratory to receipt of the analytical data packages by Parsons, was 37 days on average for the Ekonol samples. Comments on specific quality control (QC) and other requirements are discussed in detail in the attached data validation report.

1.2 SAMPLING AND CHAIN-OF-CUSTODY

The samples were collected, properly preserved, shipped under a COC record, and received at the laboratory within one day of sampling. All samples were received intact and in good condition at CAS.

1.3 LABORATORY ANALYTICAL METHODS

The groundwater samples collected from the Ekonol site were analyzed for volatile organic compounds (VOCs) including methane, ethane, and ethane; the dissolved metals arsenic, manganese, and selenium; metabolic acids; bromide; chloride; sulfate; and/or total organic carbon (TOC). Summaries of issues concerning these laboratory analyses are presented in Subsections 1.3.1 through 1.3.3. The data qualifications resulting from the data review and statements on the laboratory analytical precision, accuracy, representativeness, completeness, and comparability (PARCC) are discussed for each analytical method in Section 2. The laboratory data were reviewed and may be qualified with the following validation flags:

"U" - not detected at the value given,

"UJ" - estimated and not detected at the value given,

"J" - estimated at the value given,

"N" - presumptive evidence at the value given, and

"R" - unusable value.

The validated laboratory data were tabulated and are presented in Attachment A.

1.3.1 Volatile Organic Analysis Including Methane, Ethane, and Ethene

The groundwater samples collected from the Ekonol site were analyzed for VOCs using the USEPA SW-846 8260B analytical method. In addition, these groundwater samples were analyzed for methane, ethane, and ethene using the modified USEPA approved RSK-175 analytical method. Certain reported results for these samples were considered estimated due to noncompliant sample holding times and field duplicate precision. Therefore, the reported VOC and methane, ethane, and ethene analytical results were 100% complete (i.e., usable) based upon the groundwater data presented. PARCC requirements were met.

1.3.2 Metals Analysis

Certain groundwater samples collected from the Ekonol site were analyzed for dissolved arsenic, manganese, and selenium using the USEPA SW-846 6010B analytical method. The reported results for the metals samples did not require qualification resulting from data validation. Therefore, the reported metals analytical results were 100% complete (i.e., usable) based upon the groundwater data presented. PARCC requirements were met.

1.3.3 Other Parameters

The groundwater samples collected from the Ekonol site were analyzed for metabolic acids using a CAS HPLC modified analytical method; bromide, chloride, and sulfate using the USEPA 300.0 analytical method; and TOC using the USEPA SW-846 9060 analytical method. Holding times, laboratory blanks, matrix spike/matrix spike duplicate, laboratory duplicate precision, laboratory control samples, instrument calibrations, quantitation limits, sample result identification, and field duplicate precision were reviewed for compliance. The reported results for these samples did not require qualification resulting from data validation with the exception of the positive butyric acid results for sample PMW-7D and its field duplicate sample PMW-70D. These results were considered estimated and qualified “J” due to a high field duplicate precision (64%RPD). Therefore, the reported analytical results for the wet chemistry parameters were 100% complete (i.e., usable) based upon the groundwater data presented. PARCC requirements were met.

SECTION 2

DATA VALIDATION REPORT

2.1 GROUNDWATER SAMPLES

Data review has been completed for data packages generated by CAS containing groundwater samples collected from the Ekonol Facility site. The specific samples contained in these data packages, the analyses performed, and a usability summary are presented in Table 2.1-1. All of these samples were properly preserved, shipped under a COC record, and received intact by the analytical laboratory. The validated laboratory data are presented in Attachment A.

Data validation was performed for all samples in accordance with the most current editions of the USEPA Region II SOPs and the NYSDEC ASP for organic and inorganic data review. This data validation and usability report is presented by analysis type.

2.1.1 Volatiles Including Methane, Ethane, and Ethene

The following items were reviewed for compliancy in the volatile analysis:

- Custody documentation
- Holding times
- Surrogate recoveries
- Matrix spike/matrix spike duplicate (MS/MSD) precision and accuracy
- Laboratory control sample (LCS) recoveries
- Laboratory method blank and trip blank contamination
- Instrument performance
- Initial and continuing calibrations
- Internal standard responses
- Field duplicate precision
- Sample result verification and identification
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols with the exception of holding times and field duplicate precision.

Holding Times

All holding times for volatile analysis were compliant and within the 14-day requirement for all samples with the exception of the diluted reanalysis samples INJ-01DL and PMW-1DDL which exceeded the holding time requirement by one to three days. Therefore, the results for these samples were considered estimated, possibly biased low, with positive results qualified "J" and nondetected results qualified "UJ".

Field Duplicate Precision

The precision (relative percent difference; RPD) measurements for the field duplicate pair PMW-7D and PMW-70D were considered acceptable with the exception of the precision results for methane (152%RPD), ethane (50%RPD), and ethene (83%RPD). Therefore, the results for these compounds were considered estimated and qualified "J" for PMW-7D and PMW-70D.

Usability

All volatile groundwater sample results including methane, ethane, and ethene were considered usable following data validation.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The volatile groundwater presented were 100% (i.e., usable). The validated volatile laboratory data are tabulated and presented in Attachment A.

It was noted that the samples PMW-1D, PMW-2D, INJ-01, PMW-7D, and PMW-70D were diluted and reanalyzed due to the exceedance in instrument calibration ranges for cis-1,2-dichloroethene; sample PMW-8D was diluted and reanalyzed due to the exceedance in instrument calibration ranges for trichloroethene; and samples PMW-1D, PMW-4D, PMW-5D, PMW-7D, PMW-70D, and RMW-4D were diluted and reanalyzed due to the exceedance in instrument calibration ranges for methane. Therefore, the diluted result for these compounds was reported for these samples in the validated laboratory data table in Attachment A.

2.1.2 Dissolved Arsenic, Manganese, and Selenium

The following items were reviewed for compliancy in the metals analysis:

- Custody documentation
- Holding times
- Initial and continuing calibration, and preparation blank contamination
- Initial and continuing calibration verifications
- Interference check sample recoveries
- Matrix spike recoveries

- Laboratory duplicate precision
- Field duplicate precision
- Laboratory control sample recoveries
- Serial dilutions
- Sample result verification and identification
- Quantitation limits
- Data completeness

These items were considered compliant and acceptable in accordance with the validation protocols.

Usability

All metals sample results were considered usable following data validation.

Summary

The quality assurance objectives for measurement data included considerations for precision, accuracy, representativeness, completeness, and comparability. The metals data presented were 100% complete (i.e., usable). The validated groundwater laboratory data are tabulated and presented in Attachment A.

TABLE 2.1-1

SUMMARY OF SAMPLE ANALYSES AND USABILITY
EKONOL FACILITY – GROUNDWATER

SAMPLE ID	MATRIX	SAMPLE DATE	VOCs	METHANE, ETHANE, ETHENE	METALS	OTHER
PMW-2D	WATER	12/11/08	OK	OK		OK
PMW-3D	WATER	12/11/08	OK	OK	OK	OK
PMW-4D	WATER	12/11/08	OK	OK	OK	OK
PMW-6D	WATER	12/11/08	OK	OK		OK
RMW-4D	WATER	12/11/08	OK	OK		OK
PMW-1D	WATER	12/12/08	OK	OK	OK	OK
MW-7D	WATER	12/12/08	OK	OK	OK	OK
PMW-6D	WATER	12/15/08	OK	OK		OK
PMW-7D	WATER	12/15/08	OK	OK	OK	OK
PMW-8D	WATER	12/15/08	OK	OK		OK
PMW-70D	WATER	12/15/08	OK	OK	OK	OK
INJ-01	WATER	12/15/08	OK	OK		OK
TRIP BLANK	WATER	12/15/08	OK	OK		
		TOTAL SAMPLES	13	13	6	12

NOTES: OK - Sample analysis considered valid and usable.

ATTACHMENT A

VALIDATED LABORATORY DATA

Ekonol Facility Validated Groundwater Analytical Results Wheatfield, New York SDG: R2847751		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	INJ-01 1163255 Columbia R2847751 WATER 12/15/2008 2/6/2009	MW- 7D 1162556 Columbia R2847751 WATER 12/11/2008 2/6/2009	PMW-1D 1162555 Columbia R2847751 WATER 12/11/2008 2/6/2009	PMW-2D 1162550 Columbia R2847751 WATER 12/11/2008 2/6/2009	PMW-3D 1162554 Columbia R2847751 WATER 12/11/2008 2/6/2009	PMW-4D 1162551 Columbia R2847751 WATER 12/11/2008 2/6/2009	PMW-5D 1162553 Columbia R2847751 WATER 12/11/2008 2/6/2009
CAS NO.	COMPOUND	UNITS:							
	VOLATILES								
75-00-3	Chloroethane	UG/L	1300 U	2500 U	2500 U	1000 U	250 U	1000 U	2500 U
75-34-3	1,1-Dichloroethane	UG/L	62 J	2500 U	2500 U	40 J	250 U	1000 U	100 J
75-35-4	1,1-Dichloroethene	UG/L	220 J	2500 U	280 J	88 J	250 U	1000 U	110 J
156-59-2	cis-1,2-Dichloroethene	UG/L	120000 J	53000	130000 J	76000	5600	22000	71000
156-60-5	trans-1,2-Dichloroethene	UG/L	1100 J	350 J	1500 J	260 J	26 J	140 J	540 J
127-18-4	Tetrachloroethene	UG/L	100 J	2500 U	2500 U	1000 U	250 U	1000 U	2500 U
71-55-6	1,1,1-Trichloroethane	UG/L	1300 U	2500 U	2500 U	1000 U	250 U	1000 U	2500 U
79-01-6	Trichloroethene	UG/L	14000	2600	14000	2300	550	1000	6900
75-01-4	Vinyl Chloride	UG/L	3500	1400 J	4800	1600	130 J	680 J	1300 J
	RSK-175								
74-84-0	Ethane	UG/L	6.4	5.3	18	6.6	6.4	17	15
74-85-1	Ethene	UG/L	12	15	25	9.3	8.7	14	21
74-82-8	Methane	UG/L	66	62	200	39	36	120	100
	METALS, DISSOLVED								
7440-38-2	Arsenic	UG/L		10 U	10 U		10 U	10 U	
7439-96-5	Manganese	UG/L		437	377		76.4	116	
7782-49-2	Selenium	UG/L		10 U	10 U		10 U	10 U	
	WET CHEMISTRY								
BROMIDE	Bromide	MG/L	5.2	3.67	2.11	17.4	2.43	2.48	3.48
16887-00-6	Chloride	MG/L	564	232	482	442	172	120	216
14808-79-8	Sulfate	MG/L	260	649	1530	270	750	635	352
TOC	Total Organic Carbon	MG/L	441	278	44.5	194	204	113	196
	FATTY ACIDS								
ACETIC ACID	Acetic Acid	MG/L	340	420	20	560	140	150	230
BUTYRIC	Butyric Acid	MG/L	120	10 U	2 U	210	56	2 U	24
LACTIC ACID	Lactic Acid	MG/L	2 U	5 U	1 U	5 U	1 U	1 U	2 U
PROPIONIC A	Propionic Acid	MG/L	160	45	6.3	320	42	12	54
PYRUVIC AC	Pyruvic Acid	MG/L	1 U	2.5 U	0.5 U	2.5 U	0.5 U	0.5 U	1 U

Ekonol Facility Validated Groundwater Analytical Results Wheatfield, New York SDG: R2847751		Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	PMW-6D 1163253 Columbia R2847751 WATER 12/15/2008 2/6/2009	PMW-7D 1163257 Columbia R2847751 WATER 12/15/2008 2/6/2009	Dup of PMW-7D PMW-70D 1163258 Columbia R2847751 WATER 12/15/2008 2/6/2009	PMW-8D 1163250 Columbia R2847751 WATER 12/15/2008 2/6/2009	RMW-4D 1162552 Columbia R2847751 WATER 12/11/2008 2/6/2009	TRIP BLANK 1163392 Columbia R2847751 WATER 12/15/2008 2/6/2009
CAS NO.	COMPOUND	UNITS:						
	VOLATILES							
75-00-3	Chloroethane	UG/L	500 U	1000 U	1300 U	1300 U	250 U	5 U
75-34-3	1,1-Dichloroethane	UG/L	500 U	66 J	80 J	1300 U	250 U	5 U
75-35-4	1,1-Dichloroethene	UG/L	29 J	110 J	110 J	95 J	250 U	5 U
156-59-2	cis-1,2-Dichloroethene	UG/L	17000	84000	92000	48000	5400	5 U
156-60-5	trans-1,2-Dichloroethene	UG/L	230 J	400 J	580 J	310 J	28 J	5 U
127-18-4	Tetrachloroethene	UG/L	500 U	1000 U	1300 U	600 J	250 U	5 U
71-55-6	1,1,1-Trichloroethane	UG/L	41 J	1000 U	1300 U	1300 U	250 U	5 U
79-01-6	Trichloroethene	UG/L	310 J	2400	2900	66000	660	5 U
75-01-4	Vinyl Chloride	UG/L	170 J	2600	2600	2300	79 J	2 U
	RSK-175							
74-84-0	Ethane	UG/L	3.6	7.8 J	13 J	6.2	28	1 U
74-85-1	Ethene	UG/L	12	6.3 J	15 J	2	2.1	1 U
74-82-8	Methane	UG/L	56	230 J	1700 J	4.6	130	2 U
	METALS, DISSOLVED							
7440-38-2	Arsenic	UG/L		10 U	10 U			
7439-96-5	Manganese	UG/L		337	299			
7782-49-2	Selenium	UG/L		10 U	10 U			
	WET CHEMISTRY							
BROMIDE	Bromide	MG/L	1.06	5.39	5.82	3.8	1.91	
16887-00-6	Chloride	MG/L	676	213	188	254	743	
14808-79-8	Sulfate	MG/L	4.02	72.3	54.5	1210	130	
TOC	Total Organic Carbon	MG/L	266	476	496	263	168	
	FATTY ACIDS							
ACETIC ACID	Acetic Acid	MG/L	180	560	660	230	74	
BUTYRIC	Butyric Acid	MG/L	37	18 J	35 J	37	18	
LACTIC ACID	Lactic Acid	MG/L	1 U	5 U	10 U	2 U	1 U	
PROPIONIC A	Propionic Acid	MG/L	26	51	62	39	34	
PYRUVIC AC	Pyruvic Acid	MG/L	0.5 U	2.5 U	5 U	1 U	0.5 U	